Four Essays on Tax Misperception

DOCTORAL THESIS

to acquire the academic degree of
doctor rerum politicarum
(Doctor of Economics and Management Science)

submitted to the

School of Business and Economics of
Humboldt-Universität zu Berlin

by

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Date of Colloquium: June 2, 2023

Abstract

This dissertation consists of four chapters on tax misperception. Tax misperception refers to the concept that taxpayers are unable to correctly assess their own tax burden. All four chapters relate to this concept in a broader sense. Chapter 1 reviews the previous literature on tax misperceptions and systematizes it through the development of the Behavioral Taxpayer Response Model. The extent of tax misperception is determined by information availability and personal characteristics. Under the assumption that tax information is available, taxpayers may even misperceive the tax burden because they behave in a rational bounded manner. The extensive literature also shows that there is little literature on corporations. We address this research gap in Chapter 2, which analyzes the misperception of tax rates by firms in Germany. We survey German small and medium-sized enterprises (SMEs) on tax issues. To overcome data limitations, we use an innovative approach to measure tax rate misperception that provides robust estimates. In general, firms significantly misperceive their average (ATR) and marginal tax rates (MTR) and have problems with the concept MTR. Misperceptions tend to be influenced by the complexity of the tax system, tax knowledge, and satisfaction with the current tax system. It is important to examine tax misperception because it can lead to biased decisions. In the context of wealth taxation, we use a survey experiment in Chapter 3 to show that misperception of a yearly wealth tax, due to its mathematical complexity, leads to a biased preference for wealth taxation. Informing respondents about the actual tax burden leads to significantly lower preferred tax parameters. In the final Chapter 4, we question the findings of a study on tax avoidance commissioned by the Greens/EFA in the European Parliament. This study attracted media attention because it claimed that multinational enterprises in Germany pay far less tax than the statutory tax rate would suggest. News is an important source of information that people can use in their attitudes toward tax reforms. We demonstrate that their findings are wrong and help to increase tax transparency in Germany.

Zusammenfassung

Die vorliegende Dissertation besteht aus vier Kapiteln zum Thema Steuerfehlwahrnehmung. Unter Steuerfehlwahrnehmung versteht man, wenn Steuerzahler:innen nicht in der Lage sind, ihre eigene Steuerlast richtig einzuschätzen. Alle vier Kapitel beziehen sich auf dieses Konzept in einem breiteren Sinne. Kapitel 1 gibt einen Überblick über die bisherige Literatur zu Steuerfehlwahrnehmung und systematisiert sie durch die Entwicklung des Bevavioral Taxpayer Response Model. Das Ausmaß der Steuerfehlwahrnehmung wird unter anderem durch die Verfügbarkeit von Informationen und persönliche Merkmale beeinflusst. Auch wenn Steuerinformationen verfügbar sind, schätzen die Steuerzahler:innen die Steuerlast falsch ein, weil sie sich in einem begrenzten Maße rational verhalten. Die umfangreiche Literatur zeigt auch, dass es nur wenig Literatur im Bezug auf Unternehmen gibt. Wir schließen diese Forschungslücke in Kapitel 2, indem wir die Fehlwahrnehmung von Steuersätzen durch Unternehmen in Deutschland analysieren. Wir befragten deutsche kleine und mittlere Unternehmen (KMU) zu Steuerfragen. Um Datenbeschränkungen zu überwinden, verwenden wir einen innovativen Ansatz zur Messung der Fehlwahrnehmung von Steuersätzen, der robuste Schätzungen liefert. Im Allgemeinen nehmen die Unternehmen ihre durchschnittlichen Steuersätze und Grenzsteuersätze deutlich falsch wahr und haben Probleme mit dem Konzept des Grenzsteuersatzes. Fehlwahrnehmungen werden tendenziell von der Komplexität des Steuersystems, dem vorhandenen Steuerwissen und der Unzufriedenheit mit dem aktuellen Steuersystem beeinflusst. Es ist wichtig, die Fehlwahrnehmungen von Steuern zu untersuchen, da sie zu verzerrten Entscheidungen führen können. Im Zusammenhang mit der Vermögensbesteuerung zeigen wir in Kapitel 3 anhand eines Umfrageexperiments, dass die Fehlwahrnehmung der jährlichen Vermögensteuer aufgrund ihrer mathematischen Komplexität zu einer verzerrten Präferenz für die Vermögensbesteuerung führt. Informiert man die Befragten über die tatsächliche Steuerbelastung, führt dies zu deutlich niedrigeren präferierten Steuersätzen. In dem abschließenden Kapitel 4 überprüfen wir die Ergebnisse einer Studie zur Steuervermeidung, die von den Grünen/EFA im Europäischen Parlament in Auftrag gegeben wurde. Diese Studie erregte große Aufmerksamkeit in den Medien, weil sie behauptete, dass multinationale Unternehmen in Deutschland weit weniger Steuern zahlen, als der gesetzliche Steuersatz vermuten ließe. Nachrichten sind eine wichtige Informationsquelle für Menschen, welche diese in ihrer Einstellung zu Steuern und Steuerreformen miteinbeziehen können. Wir zeigen, dass die Ergebnisse falsch sind und tragen damit zur Steuertransparenz in Deutschland bei.

Acknowledgements

This dissertation is the result of my PhD studies in Business Taxation at Humboldt University of Berlin. This work would have not been possible without the support of many people who have accompanied me during my PhD studies and who I am grateful to.

First and foremost, I would like to thank my PhD supervisor Prof. Dr. Ralf Maiterth, who has been extremely supportive during this time with his knowledge and experience. Without his constructive and helpful feedback throughout my doctoral studies, this dissertation would not have been possible. I am equally indebted to my second supervisor, Prof. Dr. Joachim Gassen, for his valuable comments over the years and for taking the time to review my dissertation.

It has been a great pleasure to work at the Chair of Business Taxation at Humboldt University of Berlin, where I have had the opportunity to work with many great and interesting people. First of all, I would like to thank my colleague, mentor and friend Dr. Malte Chirvi, with whom I had the privilege to share the office. I would also like to thank my two wonderful colleagues Leonie Babilas and Karina Körösi, who supported me all the way and with whom I could share many fun times. In addition, I would like to thank all current and former student assistants for their continuous support. A special thanks goes to Susanne Bere for her great support with all administrative tasks.

During the years of my PhD studies, I had the privilege to work with many outstanding researchers. In particular, I have benefited from the tremendous knowledge and experience of my co-authors Prof. Dr. Kay Blaufus, Prof. Dr. Martin Fochmann, Prof. Dr. Ralf Maiterth, Prof. Dr. Dr. h.c. Dr. h.c. Caren Sureth-Sloane, Dr. Malte Chirvi, Dr. Cornelius Schneider, and Vanessa Heinemann-Heile. I am grateful to all of them for their constant advice and valuable comments at all times - even in busy times. I would also like to acknowledge the intensive cooperation between the Paderborn University and the Humboldt University of Berlin within the Collaborative Research Center TRR 266 "Accounting for Transparency". The project work with Vanessa Heinemann-Heile has always been fun and has worked out great despite the regional distance. During research visits to the Paderborn University, Prof. Dr. Dr. h.c. Dr. h.c. Caren Sureth-Sloane and her team always made me feel very welcome.

A very special thanks goes to my family and friends who have supported me throughout my PhD, and especially to my girlfriend Linh.

Berlin, December 2022

Hans-Peter Huber

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An Introductory Summary

Taxes are an important factor when it comes to financial decisions, such as investments and financing. This applies to decisions made by private individuals as well as to decisions made in firms (Graham, 2003). Most studies assume that decision-makers perceive taxes accurately and hence, can form rational expectations about the tax consequences of their decisions. However, misperceptions of tax regulations may occur due to the variety and complexity of tax information provided by tax regulators. Prior literature on individuals has shown that this is often the case.

This doctoral thesis consists of four essays, all dealing with *tax misperception* in a broader sense. The term *tax misperception* refers to the concept that taxpayers are unable to properly assess their tax burden. In the literature, other terms such as "misconception" or "biased beliefs" are also used. Different aspects of *tax misperception* are addressed in this doctoral thesis. First, the literature is systematically reviewed in *Chapter 1*. In *Chapter 2*, *tax misperception* is fundamentally examined for firms. How *tax misperception* can influence tax preferences for wealth taxation is shown in *Chapter 3*. In *Chapter 4*, we increase overall corporate tax transparency by correcting the results of a commissioned study. The following is a brief summary of the four chapters and the key findings of each chapter.

Chapter 1 reviews previous literature on *tax misperception*. The literature survey demonstrates that many individual taxpayers suffer from significant tax misperceptions. For example, less than half of individual taxpayers can correctly estimate their own average tax rate (ATR) or that of other income brackets. Even managers of large private and public corporations sometimes make their decisions based on incorrect tax rates – when they use ATRs instead of the theoretical correct marginal tax rate. Tax misperception results from lack of tax knowledge. But even when tax information is available, taxes may be misperceived due to bounded rationality. It may simply take too much cognitive effort to apply tax information correctly. We summarize results of tax misperception research in a *Behavioral Taxpayer Response Model*. The model describes how subjective tax perception is determined by tax information and individual characteristics and how resulting tax misperception translates into decisions. While there is an extensive body of tax misperception literature research on individual taxpayers, research on tax misperception in firms and its effects on firms' business decisions are lacking.

Chapter 2 fills the research gap of tax misperception in firms addressed in Blaufus et al. (2022). We use survey data on German firms to quantify tax rate misperception and identify drivers of tax rate misperception. Tax misperception in firms is expected to be different from individuals as firm owners and managers are influenced by incentive structures, advised by internal or external tax experts, and exposed to more complex business taxes. To understand the heterogeneity in firms' misperception we use a large sample that covers firms of different sizes and legal forms and includes small or medium-sized firms (SMEs). We overcome data limitations by adopting an innovative approach in which (1) firms estimate their ATR and

MTR based on a *given profit* and (2) benchmark tax rates incorporate average values from official tax statistics. This approach leads to robust estimates of tax rate misperceptions. More than 60% (50%) of the surveyed firms misperceive their ATR (MTR). Sole proprietors and partnerships show a clear pattern of misperception: ATRs are overestimated, while MTRs are underestimated. Corporations are generally better in their assessment of their ATR and MTR as long as only the corporate level (retained earnings) is considered. If the taxation of shareholders is included, the share of misperceived corporations increases significantly. The legal form, the size as well as tax knowledge and the satisfaction with the tax system influence the degree of misperception. Furthermore, many firms have difficulties with the concept of the marginal tax rate: (1) The relation of ATR and MTR is often misclassified. Sole proprietorships and partnerships tend to linearize the tax rate schedule. (2) Firms most frequently use ATRs in their investment decisions – instead of using the theoretically correct MTR. However, a potential bias of the wrong tax rate is attenuated by its misperception (overestimation).

Chapter 3 addresses biased tax preferences as one potential outcome of tax misperception. The individual capacity to form personal preferences constitutes an essential element of the democratic process. At the same time, policies with far-reaching consequences often require profound expertise to craft and enact. Wealth tax is such an example. This chapter quantifies shifts in stated preferences for wealth taxation caused by misperceived burden consequences of commonly politically discussed tax parameters: tax allowances and tax rates. For this, we conduct a randomized survey experiment in a 2x2 design. Our respondents were randomly selected to indicate both their preferred tax allowance and tax rate for either a yearly or a one-time wealth tax. Our treatment group was provided with easy-to-understand information on the resulting total tax burden for the respective instrument. We find the preferred effective tax rate to drop significantly and substantially for a yearly wealth tax if our participants are fully informed, whereas we do not find this effect for the one-time wealth tax. Interestingly, even if misperceptions are resolved through our information treatment, our respondents still prefer the yearly wealth tax over a one-time wealth tax. The preferred effective tax burden of a yearly wealth tax is about 25 percentage points higher (40.0% vs. 15.2%). Proposing higher effective tax rates for a tax instrument does not necessarily translate into a preference for one over the other. Therefore, we complemented our design with a within-subject question. Our respondents in this setting face more the direct comparison: the one-time wealth tax of €X against the yearly wealth tax of an average of €X per year. The direct comparison supports our main treatment finding: respondents still clearly indicate a preference for a yearly wealth tax. Our respondents also briefly reasoned their choice in an open-ended survey question. The preference for a yearly wealth tax is mainly explained by a general preference for smaller payments compared to one concentrated payment, and also by continuous and predictable tax revenues for the government.

Chapter 4 addresses the potential management of *tax misperception*. Parties can use their media presence to influence public attitudes and perceptions on certain issues (Gunn, Koch, and Weyzig, 2020). This is what happened with the study commissioned by the Greens/

EFA in the European Parliament: "Effective Tax Rates of Multinational Enterprises in the EU" (Janský, 2019). This study concluded that companies in Germany pay much less tax than the statutory tax rate. This news was heavily discussed in both media and political circles when the study was released in early 2019, and should potentially help raise voter awareness of the need for further tax reporting and/or tax increases. In this chapter, we take a closer look at this study and contribute to the overall transparency of corporate taxation in Germany. Taking into account tax exemptions for certain industries and non-profit companies, the tax exemption for dividends (Sec. 8b KStG), and the possible double counting of profits in tax groups, we find that the actual effective tax rate (ETR) is very close to the statutory tax rate in Germany. Regardless of legal form or multinational activity, German corporations have an effective tax rate of around 29.1%. However, this result is not evidence for the absence of tax planning activities of German corporations, since tax planning activities cannot be revealed by low ETRs of individual financial statements.

1 Tax Misperception and its Effect on Decision Making - Literature Review and Behavioral Taxpayer Response Model

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Abstract

Previous accounting research shows that taxes affect decision making by individuals and firms. Most studies assume that agents have an accurate perception regarding their tax burden. However, there is a growing body of literature analyzing whether taxes are indeed perceived correctly. We review 128 studies on the measurement of tax misperception and its behavioral implications. The review reveals that many taxpayers have substantial tax misperceptions that lead to biased decision making. We develop a Behavioral Taxpayer Response Model on the impact of provided tax information on tax perception. Besides individual traits, characteristics of the tax information and the decision environment determine the extent of tax misperception. We discuss opportunities for future research and methodological limitations. While there is much evidence on tax misperception at the individual level, we hardly find any research at the firm level. Little is known about the real effects of managers' tax misperception and on how tax information is strategically managed to impact stakeholders. This research gap is surprising as a large part of the accounting literature analyzes decision making and disclosure of firms. We recommend a mixed-method approach combining experiments, surveys, and archival data analyses to improve the knowledge on tax misperception and its consequences.

1.1   Introduction

In this paper, we review and evaluate the research on tax misperception and its effects on decision making. Previous accounting research provides evidence that taxes significantly influence decision making, including decisions on investment and financing. Most of this work is based on the assumption that individual and firm decision makers can form rational expectations about the tax consequences of their choices. However, taxation is highly complex, taxes are often not salient, and in many cases agent behavior is influenced by framing effects. It is therefore unclear whether economic agents understand the tax consequences of their decisions. With the rise of behavioral economics in the last two decades, tax researchers have also intensified their work on tax misperception and its effect on economic decisions. This study aims to review this research from its beginnings in the late 1950s to the present. In total, we present and discuss 128 mainly empirical studies that measure the extent of misperception regarding income, wealth, and excise taxes in different countries, or examine the effects of tax misperception on taxpayers' decision making. In the literature, different terms are used for what we refer to as misperception. Some authors use 'misconception' and others 'biased beliefs.' We consider all of these terms synonymous and in the following uniformly refer to 'misperception.'

The reviewed studies which measure individuals' tax perception by surveying taxpayers reveal substantial tax misperception. However, findings on the degree and the direction (under- versus overestimation) of misperception are inconclusive, and it remains unclear where the differences originate. Another shortcoming of these studies is that they do not analyze behavioral effects of tax misperception. In contrast to research on individuals' tax misperception in several countries, studies on firms are scarce and cross-country studies do not exist at all. Also, the role of taxrelated accounting information on individual and corporate tax misperception and its impact on decision making is underexplored. This research gap is surprising as much of the literature in accounting and finance analyzes decision making of firms.

Further, we review a body of mainly experimental literature on tax perception and behavioral response. Studies in this field show that even if accurate tax information is provided, taxpayers often do not incorporate taxes into their decision making in a way predicted by rational choice theory. It is also shown that misperception of tax facts, e.g., due to tax complexity or lack of salience, results in distorted decisions. A potential weakness of these real effects studies is that they do not identify tax misperception directly. Rather, they identify tax misperception via behavioral response and infer that these responses are induced by tax misperception.

Finally, we review studies that deal with the management of others' tax perception. There are few studies, but they indicate that corporate tax information is strategically managed to impact stakeholders' perception.

To develop well-targeted tax regulations and understand the underlying biases of taxpayers, both tax misperception and its implications need to be explored carefully. In doing so, the following two questions have to be addressed: (1) Do economic agents misperceive taxes? (2) Do these misperceptions translate into distorted decisions?

In sum, our study contributes to tax-related accounting research in three ways. First, we provide the first comprehensive overview of research on tax misperception and its effects on individual and corporate decisions including the management of tax perception.[1] In the online appendices (see supplemental data), we provide one summary table each for Section 3 (Table A1: Tax Misperception), Section 4 (Table A2: Effects of Tax Misperception on Decision Making) and Section 5 (Table A3: Management of Tax Perception and its Impact on Stakeholders). These tables present the methodology, research question, and results of the reviewed articles and enable researchers to quickly assess the respective topics and approaches. Second, based on our review of prior research, we develop a *Behavioral Taxpayer Response Model* that illustrates the impact of the type and character of provided tax information on tax perception, whether and how the non-tax environment and individual traits moderate this relationship, and how the resulting tax perception translates into decisions. The model helps researchers to develop and define their own research questions and to derive behavioral predictions. Third, we discuss methodological challenges of the research stream and identify research gaps and avenues for future research.

Identifying and scrutinizing misperception and behavioral responses to tax information by individuals including entrepreneurs and corporate managers not only contributes to tax research, it also provides novel insights for related fields in accounting research, such as real effect studies with respect to all kinds of accounting information. Thus, we contribute to the sender-receiver paradigm of accounting information and how information that is processed and perceived by receivers translates into real effects. Stakeholders' exposure to biased and unbiased accounting information and their respective responses to voluntarily and mandatory disclosed information on firms and compensations is also likely to be distorted because of cognitive and behavioral aspects when processing this information or due to misperception of the regulatory environment. Real effect studies will benefit from our study by a deeper understanding of potential misperception and further behavioral frictions.

1.2 Selection Strategy and Overview

The survey is based on a literature search in the databases EBSCO, JSTOR, ScienceDirect, and Google Scholar. The survey consists of three parts. In Section 1.3, we focus on studies that identify tax misperception of both individuals and corporations by asking taxpayers directly about their tax perception. To provide overview of these studies, in our queries

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[1] The only other related literature review we are aware of is Fochmann et al. (2010). However, the authors focus only on six specific strands of the literature: (1) perception of marginal tax rates, (2) influence of tax complexity on tax perception, (3) taxation and work incentives, (4) tax salience, (5) tax morale and fairness and (6) money illusion. Strands (5) and (6) are not included in our study. As far as there is an overlap in (1) to (4), we expand and update the study considerably. Moreover, we explicitly exclude behavioral research on tax compliance (see for a review, e.g., Kirchler (2007) and Alm (2019).

we use keyword combinations of perception ('assessment,' 'beliefs,' 'bias,' 'misconception,' 'misperception,' 'perception,' 'salience') and the tax type ('capital tax,' 'corporate tax,' 'estate tax,' 'excise tax,' 'income tax,' 'inheritance tax,' 'property tax,' 'sales tax,' 'value added tax,' 'VAT,' 'wealth tax'). Moreover, to search studies on perception of tax-related accounting information, we use keyword combinations of perception and 'tax disclosure,' 'tax reporting,' 'tax transparency,' 'analyst,' 'investor,' 'management,' and 'manager.' In Section 1.4, we review studies that infer tax misperception from observed real behavior. We use keyword combinations denoting tax misperception ('assessment,' 'beliefs,' 'bias,' 'misconception,' 'misperception,' 'perception,' 'salience') and behavioral decisions ('avoidance,' 'consumption,' 'financing,' 'investment,' 'real effort,' 'planning,' 'saving'). Furthermore, we survey studies on corporates' tax perception management in Section 1.5. We use keyword combinations of 'tax' and 'disclosure,' 'discretion,' 'media,' 'political costs,' 'transparency,' and 'reporting.' This search strategy results in a total set of about 430 papers.

After selecting studies with a clear focus on identification of tax misperception and its effect on decision making or tax perception management, we obtain a final set of 128 mainly empirical studies (Section 1.3: 55 studies, Section 1.4: 65 studies and Section 1.5: 14 studies). Table 1.1 lists all surveyed studies grouped by methodology over time.

Interestingly, although research on tax misperception began more than sixty years ago, the majority of studies date from after 2000. As in other economic areas, this is due to the increasing importance of behavioral economics in tax research in the last two decades. Moreover, Table 1.1 reveals that most studies that identify tax misperception use a survey design, real effect studies use an experimental approach, and studies on tax perception management analyze archival data.

TABLE 1.1: Studies grouped by methodology over time

	before 1990	1990-1999	2000-2009	2010 or later	Total
Tax misperception					
Survey	12	3	6	11	32
Archival data analysis	2	1	5	10	18
Non-incentivized survey experiment	0	0	0	3	3
Incentivized survey experiment	0	0	0	2	2
Field experiment	0	0	1	0	1
Lab experiment	0	1	0	1	2
Theoretical Analysis	0	0	0	1	1
Total	14	5	12	28	59
Effects of tax mispercpetion on decision making					
Survey	2	2	3	3	10
Archival data analysis	0	0	2	8	10
Non-incentivized survey experiment	0	0	3	5	8
Incentivized survey experiment	0	0	0	2	2
Field experiment	0	0	2	3	5
Lab experiment	0	2	4	28	34
Theoretical Analysis	0	0	0	3	3
Total	2	4	14	52	72
Management of tax perception and its impact on stakeholders					
Survey	0	0	0	0	0
Archival data analysis	3	1	0	10	14
Non-incentivized survey experiment	0	0	0	0	0
Incentivized survey experiment	0	0	0	0	0
Field experiment	0	0	0	0	0
Lab experiment	0	0	0	1	1
Theoretical Analysis	1	0	0	0	1
Total	4	1	0	11	16

Notes: This table gives an overview of all 128 surveyed studies. Since some studies use more than one methodology, the number of total studies does not add up to 128.

1.3 Tax Misperception

In this section, we review studies which measure individual and corporate tax misperception. Table A1 (see online appendices, see supplemental data) provides information on the underlying research question, the research design and the results of each of the reviewed articles. This overview also offers information on the underlying tax type, country, subject pool, sample size and year.

1.3.1 Individual Tax Misperception

Many studies measure individuals' misperception by asking respondents to estimate income tax burdens and benchmarking reported against actual numbers. Measuring tax burden misperception encompasses three aspects.

First, researchers have to decide on the *kind of tax burden* of interest. If one studies people's attitudes towards the fairness aspects of taxation, the *average tax burden* or *average tax rate* (ATR) is relevant. If the tax burden on additional income is of interest, which is particularly relevant for decision making, the *marginal tax burden* or *marginal tax rate* (MTR) matters.

Second, the *scope of tax burden* has to be determined. Is it respondents' own tax burden or that of other taxpayers? In the latter case benchmarking is easy, since the actual tax burden can be precisely determined based on income figures provided to respondents. By contrast, benchmarking respondents' own tax burden is more challenging. Using respondents' tax return data is regarded as the 'gold standard' (Gideon, 2014, p. 1). However, as this data is often not available the actual tax burden has to be calculated based on income reported by respondents. Moreover, even if tax return data were available, it would only contain backward-looking information, while forward-looking information is necessary for decision making.

Third, the *distribution of misperceptions* has to be analyzed. What is the share of respondents who over- or underestimate tax burdens and how many respondents are not able to give estimates at all?

1.3.1.1 Perception of average income tax rates (ATRs)

'ATR studies' aim, in particular, to identify the effect of misperception on taxpayers' attitudes towards the fairness and distributional implications of the tax system. The majority of these studies is interested in respondents' own tax burden. Schmölders (1960) pioneered this field.[2] Using benchmarks that rely on reported incomes, he finds that about one third of respondents report accurate tax burdens. For the others, overestimates considerably outnumber underestimates. The percentage of overestimates is particularly high among farmers, freelancers and sole proprietors (>50%) compared to civil servants (35%) and employees (40%). Enrick (1963) and Enrick (1964) uses benchmarks based on tax return information and finds that only about 5% of respondents rate their tax burden accurately. The others tend to underestimate rather than overestimate their tax bill. Van Wagstaff (1965) uses employer payroll records for benchmarking and reports a substantial dispersion of respondents' estimates, whereby under- and overestimates are almost balanced. 13% of respondents accurately assess their tax burden. Auld (1979) uses reported income for benchmarking and finds that low-income respondents overestimate, higher-income respondents underestimate and middle-income respondents almost accurately estimate their tax burden. Gideon (2014) and Gideon (2017) uses reported income for benchmarking and shows, on average, an overestimation of ATRs across the income distribution. Ballard and Gupta (2018) also benchmarked based on reported income and found that over 20% of respondents do not know their ATR. The vast majority of the remaining respondents overstate their ATR; the variety of misperceptions is extremely pronounced. Stantcheva (2020) finds that taxpayers' estimates of the share of income paid in taxes by median households is higher than the actual value.

Three papers focus on misperception of ATRs for different income levels. Williamson (1976) shows that respondents, on average, significantly overestimate ATRs for each given income category. Overestimates und underestimates for low and high incomes differ according to respondents' income. Blaufus et al. (2015) provide evidence that nearly 50% of respondents

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[2] The original study by Schmölders is only available in German. However, some parts of his work on fiscal psychology have been translated into English (Schmölders, 2006).

report accurate ATRs. The remainder misperceive ATRs significantly, with ATRs for high (low) income underestimated (overestimated). Rees-Jones and Taubinsky (2019) show that respondents overestimate ATRs on average and perceive the tax schedule to be more linear than it actually is. However, there are also many respondents who underestimate ATRs.

In sum, the discussed papers show that a significant number of taxpayers are not able to accurately estimate either their own ATR or the ATR of other income levels. Moreover, most studies indicate a tendency to overstate the ATR, on average, although the direction of misperception seems to depend on the income level.

1.3.1.2 Perception of marginal income tax rates (MTRs)

Not surprisingly, beliefs about MTRs have been examined more often, reflecting that the main focus of tax research is on the tax effects on decision making. Gensemer, Lean, and Neenan (1965) pioneered this field. They focus on MTRs of high-income earners and establish benchmark MTRs based on reported income. They provide evidence that more than a quarter of respondents are not aware of their MTRs but do not provide further information on the extent or direction of MTR misperception. Brown (1969) derives benchmark MTRs from employers' payroll records and finds that only one fifth of the surveyed workers and nearly one third of the surveyed managers report accurate or roughly accurate MTRs. He observes far more overestimates than underestimates in both groups of respondents. Fujii and Hawley (1988) use reported income to derive benchmark MTRs and find that about one third of respondents are not able to guess their MTR. The others underrate their MTR, on average, only slightly. Further information such as the share of respondents over- or underestimating their MTR is not provided. Rupert and Fischer (1995) use tax return information for benchmarking and ask respondents for absolute numbers rather than percentages. Over 90% of respondents report misperceived MTRs, with overestimation twice as common as underestimation. Gemmell, Morrissey, and Pinar (2003) and Gemmell, Morrissey, and Pinar (2004) do not ask respondents to give precise MTR estimates but to select one out of five given 'additional tax burden classes' and benchmark the responses based on reported income. Due to this rather rough measure, it is not surprising that the authors report a rather high level of accurate estimates at over 30%. The remaining respondents exhibit a bias towards an overestimate although many respondents report underestimates, too. Hundsdoerfer and Sichtmann (2009) explore a subject pool of practicing physicians. They compare the mean of MTRs reported to the corresponding average MTR calculated on the data of the official German income tax statistics and find both numbers are equivalent. However, an indepth analysis shows that about one quarter of participants report MTRs that do not exist. Gideon (2014) and Gideon (2017) benchmarks against MTRs computed on reported income and finds fairly accurate reported MTRs, at the mean, but estimates exhibit substantial heterogeneity. Individuals at lower income levels overestimate their MTR, whereas higher-income individuals underestimate MTR. Blaufus et al. (2015) use reported income for benchmarking and demonstrate that respondents misperceive their MTR more than their ATR. Moreover, taxpayers tend to underestimate (overestimate) the MTR for higher (lower)

income levels. One in six respondents mistakes ATRs for MTRs. The widespread use of ATRs instead of MTRs is also confirmed by Bartolome (1995) in an experimental setting. Similar, Rees-Jones and Taubinsky (2019) find that taxpayers use their ATR rather than their MTR.[3]

Lewis (1978) is, to the best of our knowledge, the only study on the perception of other individuals' MTR, finding a uniform underestimate by about 10% for each income bracket and less misperception for MTRs that are close to respondents' income bracket. Approximately 10% of respondents fail to provide MTR estimates at all.

There is also some literature on misperception of income tax progressivity. Slemrod (2006) shows that the majority of respondents favor switching to a flat-rate income tax because they misperceive the current system being regressive.[4] Gideon (2014) and Gideon (2017) finds that only slightly more than one fifth of respondents understand tax schedule progressivity to mean that MTRs are higher than ATRs. Rees-Jones and Taubinsky (2019) show that progressivity in the US income tax code is underestimated since the perceived income tax schedule is more linear than the actual schedule. Similar evidence is provided by Stantcheva (2020).

In sum, similar to the findings regarding ATR perception, research shows that many taxpayers know neither their own MTR nor MTRs related to other income levels. Over- as well as underestimations of the MTR are observed which tend to depend on the income level. Moreover, some taxpayers mistake ATRs for MTRs which leads to an underestimation of the MTR given a progressive tax schedule.

1.3.1.3   Perception of other taxes

While most of the literature focuses on income tax misperception, there is also some evidence for other taxes. One example is the US estate tax. The frequently cited studies by Bartels (2005) and Slemrod (2006) refer to a survey in which half of respondents state that they believe 'most families' are hit by the estate tax. In fact, at best only about 2% of all deaths actually led to an estate tax liability. Similar results are found by Kuziemko et al. (2015), Sides (2016), Chirvi and Schneider (2019), and Stantcheva (2020). For Germany, Bischoff and Kusa (2019) show that 51% of respondents wrongly believe that a child who inherits €100,000 has to pay inheritance tax.

Cabral and Hoxby (2012) analyze the salience of the US property tax and show that homeowners with tax escrow perceive their property tax less accurately than those who write property tax checks to local government. However, the share of those who under- and overestimate is similar in both groups of homeowners.

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[3]   Using average instead of marginal figures is not tax specific (see Shin (1985) for electricity demand and Faulhaber and Baumol (1988) for pricing decisions).

[4]   However, beliefs on tax evasion among high-income individuals (Bakija and Slemrod, 2004, p. 69, provide evidence for the existence of these beliefs) proved to be not statistically significant.

Regarding excise taxes, a survey by TNS Opinion & Social (2015) demonstrates that only 65% of individuals in the EU are aware of the standard VAT rate in their country. Chetty, Looney, and Kroft (2009) as well as Taubinsky and Rees-Jones (2018) find similar results for the US. Ferber (1954) finds a rather inaccurate perception of *changes* in excise taxes on theater tickets, cars, luggage, shoes, and refrigerators. For the UK, Gemmell, Morrissey, and Pinar (2003) and Gemmell, Morrissey, and Pinar (2004) analyze how individuals perceive the extra burden on household expenses that results from a one percentage point increase in the VAT rate and find that respondents tend to overestimate the additional burden.

Fisher and Wassmer (2017) show that respondents overestimate the gasoline tax and hence the gasoline tax burden of an average driver in their respective state. Related to Cabral and Hoxby (2012) on different property tax payment channels, Finkelstein (2009) finds that car drivers who pay their road tolls in cash, on average, perceive toll payments significantly more accurately than electronic toll collection users.

In sum, this section shows that tax misperception is not limited to income taxes but is also substantial in regard to other taxes such as consumption and wealth taxes.

1.3.2 Corporate Tax Misperception

In contrast to studies on individuals, research on corporations' tax perception is scarce.[5] Graham et al. (2017) provide evidence that corporate managers confuse average and marginal corporate tax rates in decision making. The authors ask tax executives of US corporations on the primary tax rate they use in various business decisions and let the participants choose from '(1) U.S. statutory tax rate (STR), (2) GAAP effective tax rate (ETR), (3) jurisdiction-specific statutory tax rate, (4) jurisdiction-specific effective tax rate, (5) marginal tax rate, and (6) other' (p. 3139). The most frequent answer of private firms is 'U.S. statutory tax rate' (34.1%), whereas public firms most frequently report 'GAAP effective tax rate' (27.4%). Only 12.5% (10.8%) of private (public) firms use the MTR, which is appropriate for decision-making.

Several studies examine whether corporate managers, investors, and financial analysts perceive tax-related accounting information accurately. Financial reporting is aimed at improving the information environment and reducing misperception. However, tax accounting rules are complex and require an understanding of both tax law and financial accounting. Thus, processing tax-related information is costly and it is therefore reasonable that misperception of tax-related accounting information might occur.

Bratten et al. (2017) study misperception of tax-related accounting information and find that the accuracy of managers' ETR forecasts decreases when GAAP ETRs include discrete items

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[5] Some earlier studies written in German are at least loosely linked to tax perception. These studies find that the majority of surveyed German corporations do not properly incorporate taxes in their investment decisions (Hüsing, 1999; Kling, 1992; Schwenk, 2003; Wittmann, 1986). A closely related study by Dietrich, Kiesewetter, and Moosmann (2008) analyzes how Swedish firms perceive the tax burden associated with foreign direct investments (FDI) in Austria relative to Germany.

(e.g., transitory gains and losses or settlements with tax authorities) or when tax rate complexity (capturing absolute changes in ETR, the absolute difference between the statutory tax rate and the ETR, and ETR volatility) is high. Moreover, Gleason, Mills, and Nessa (2018) demonstrate that managers' estimates of additional tax liabilities due to tax audits are, on average, inaccurate. Eberhartinger et al. (2020) find in a laboratory experiment evidence that both trust in government and interpersonal trust affect the bargaining behavior of taxpayers and auditors and thus the outcome of tax audits.

Research regarding tax misperception of financial analysts has identified significant errors in forecasts in face of changes in tax law or tax accounting standards. Plumlee (2003) finds that the magnitude of errors in ETR forecasts increases with the complexity of tax law changes. Chen, Danielson, and Schoderbek (2003) report that a one-time deferred tax adjustment (due to an increase in the corporate tax rate) is incorrectly interpreted as a recurring item. Hoopes (2018) find increasing earnings forecasts errors when a temporary RD tax credit regulation expires. Brushwood et al. (2019) show that the early adoption of a new rule on tax accounting of stock-based compensation reduces the accuracy of analysts' ETR forecasts. In addition, research indicates that analysts make more errors in forecasting earnings of firms with tax loss carryforwards (Amir and Sougiannis, 1999) or with high book-tax differences (Weber, 2009). Also, they less accurately forecast tax expenses, pre-tax earnings and ETRs when the reported ETR includes discrete items or when tax rate complexity is high (Bratten et al., 2017). Finally, analysts' ETR forecasts are more accurate for firms that present ETR reconciliation information in percentage format rather than in dollar format (Chychyla, Falsetta, and Ramnath, 2017). Overall, this research demonstrates significant tax misperception by financial analysts. On average, forecasting tax-related information seems to be more difficult for analysts than forecasting other accounting information, as shown by Kim, Schmidt, and Wentland (2020). However, Bratten et al. (2017) show that analysts' ETR forecasts are more accurate than managers' forecasts if tax rate complexity is high.

Although financial analysts also suffer from tax misperception, there is evidence that their forecasts may still help investors to better incorporate tax-related information. Investors seem to misperceive value-relevant information reflected in tax expense items and therefore underreact to information on tax expense surprises (Thomas and Zhang, 2011). However, this mispricing of income tax expense is reduced if tax expense forecasts of analysts are available (Baik et al., 2016).

While many countries have recently adopted policies to increase corporate tax transparency, it is unclear whether this has improved the accuracy of tax perception. For example, Gleason, Mills, and Nessa (2018) find that the introduction of FIN 48, a US GAAP regulation that requires businesses to disclose income tax risks, does not improve managers' forecasts regarding necessary tax reserves, it at least improves the comparability of tax-related accounting information. However, Robinson, Stomberg, and Towery (2016) show that firms are over-reserved for uncertain tax positions after the introduction of FIN 48, and that FIN 48 reduces the relevance of tax-related accounting information. Research on IFRIC 23, an

IFRS regulation that serves a similar purpose as FIN 48 and is mandatory since 2019, is to the best of our knowledge not yet available.

Another example of recent policies to increase corporate tax transparency is (public) country-by-country reporting (CbCR). Several studies investigate both public and non-public CbCR and its real effects (Brown, 2018; De Simone and Olbert, 2019; Dutt et al., 2019; Eberhartinger, Speitmann, and Sureth-Sloane, 2020; Joshi, Outslay, and Persson, 2020; Overesch and Wolff, 2017). While it is known that the information disclosed through CbCR is potentially misleading (Lagarden et al., 2020) none of these studies scrutinizes the extent to which misperception impedes transparency and generates undesired implications.

Finally, research on misperception of tax-related accounting information reveals a link to research on tax uncertainty (e.g. Dyreng, Hanlon, and Maydew, 2019; Hanlon, Maydew, and Saavedra, 2017; Jacob, Wentland, and Wentland, 2019; Jacob and Schütt, 2020). Making accurate estimates of uncertain tax items is a challenge yet crucial for decision making. In archival studies, tax uncertainty is often measured by ETR volatility (for an overview of such tax risk measures, see, e.g. Blouin, 2014). Increasing ETR volatility is positively associated with forecast errors of tax-related accounting information (Bratten et al., 2017). Thus, tax uncertainty may be another source of tax misperception. In addition, tax misperception caused, for example, by tax complexity may be another reason for more perceived tax uncertainty by investors. In line with this reasoning, Bratten et al. (2017) find that complexity increases the dispersion of analysts' ETR forecasts, and forecast dispersion is commonly interpreted as reflecting uncertainty. Hoppe et al. (2019) provide a measure of perceived tax complexity in the tax code and framework as faced by multinational corporations. Their survey-based multi-dimensional Tax Complexity Index captures tax uncertainty as one dimension of perceived tax complexity.

In sum, the discussed papers show that corporate tax misperception seems a prevalent phenomenon. However, research on corporations' genuine tax misperception is scarce. In addition to the provisions of tax law, tax-related accounting disclosures may also induce tax misperception, especially if tax uncertainty and complexity are high.

1.4 Effects of Tax Misperception on Decision Making

The previous section has shown that many taxpayers misperceive their own tax burden. This section surveys the growing body of research on *Behavioral Taxation* that deals explicitly with the behavioral effects of tax misperception. An overview of the studies discussed in this section with detailed information on the main features of each study is provided in Table A2 (see online appendices, see supplemental data).

1.4.1   Effects of Individual Tax Misperception on Decision Making

1.4.1.1   Tax misperception, investment decisions, and risk-taking

To examine effects of tax misperception on investment and risk-taking, most researchers rely on lab experiments. Unless otherwise stated below, the presented studies do too.

First, studies show that tax misperception and its effects on investment depend on *tax salience* and *tax complexity*. Bartolome (1995) is one of the first to study the effect of tax misperception on investment decisions. He finds many individuals using the ATR 'as if' it were the MTR and thus make wrong investment decisions. Rupert and Wright (1998) add that with increasing salience of the MTR subjects make significantly better investment decisions and learn more rapidly. Rupert, Single, and Wright (2003) find that subjects do not adjust their estimates of the MTR to account for the effects of floors and phase-outs. Thus, tax base complexity increases the probability of erroneous investment decisions. Boylan and Frischmann (2006) demonstrate that tax-related decision errors increase in tax complexity and diminish over time but do not entirely disappear in competitive markets. Boylan (2013) examines the effects of heterogeneous tax information among market participants. He finds that in lab markets in which only a subset of individuals knows the applicable tax rate, the economic benefits generated by the investment of these individuals spill over to their uninformed counterparts.

Second, *tax aversion* (taxes are disliked more than equivalent costs) may result in tax misperception and thus affect investment behavior, yet the evidence is mixed.[6] In line with the expected tax aversion, Sussman and Olivola (2011) provide survey evidence that participants prefer tax-exempt bonds over equally profitable bonds that are subject to tax, while Blaufus and Möhlmann (2014) find in lab markets that the word 'taxes' induces a higher equilibrium return on traded debt securities. However, over the course of the experiment the premium disappears, suggesting that tax aversion is not a stable preference but is instead based on a decision heuristic that individuals re-evaluate in repetitive choices. By contrast, using a survey-based conjoint analysis, Hundsdoerfer and Sichtmann (2009) show that German physicians overweigh tax considerations in investment decisions but that this tax misperception is not associated with tax aversion. Fochmann and Kleinstück (2014) also study the effect of tax aversion on investment decisions in an individual choice setting, but do not find any evidence of tax aversion.

Third, prior literature investigates the impact of tax misperception on *risky investments*. Ackermann, Fochmann, and Mihm (2013) as well as Fochmann and Hemmerich (2018) find that the willingness to engage in risky investments decreases when an income tax has to be paid, although net income is identical in all their treatments. Although the reasons for this have not yet been fully clarified, the findings indicate that taxes induce additional *complexity* and thus increase subjects' perception of investment risk. Reducing the decision complexity by

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[6] The effect of using tax versus neutral frames is also investigated in tax compliance settings. Some studies find that subjects are more compliant in a tax compared to a neutral context (Baldry, 1986; Trivedi and Chung, 2006; Wartick, Madeo, and Vines, 1999), other studies find no difference between both frames (Alm, McClelland, and Schulze, 1992).

reducing the number of future states reduces the perception bias. This corresponds to the results of Abeler and Jäger (2015) who find that background complexity affects tax misperception in a real-effort setting. However, opposite results are observed with respect to tax loss-offsets. Subjects that decide between net-equivalent risky lotteries seem to overestimate the risk reduction effect of tax loss-offsets, so that taxes could also increase risk appetite in cases involving a higher probability of loss (Fochmann, Kiesewetter, and Sadrieh, 2012b; Fochmann, Kiesewetter, and Sadrieh, 2012a; Fochmann, Hemmerich, and Kiesewetter, 2016).

Further studies on the impact of tax misperception on risky investments include Blaufus and Möhlmann (2016) who examine the effect of tax rate misperception on risk taking. They compare the effect of a wealth tax and a net equivalent income tax on risk-taking and find greater risk taking in the presence of a wealth tax, which they explain with misperceived 'low' wealth tax rate. Möhlmann (2013) demonstrates that subjects invest in riskier portfolios in case of a foreign tax rather than a domestic tax on foreign dividend income. This shows that sentiment towards different tax collectors affects decision making. Using prospect theory (Kahnemann and Tversky, 1979), researchers have derived and/or tested tax effects on risk taking that deviate from rational choice predictions. Hlouskova and Tsigaris (2012) theoretically analyze the effect of a proportional capital income tax on portfolio decisions and show that tax-induced reactions depend on the reference point. Falsetta, Rupert, and Wright (2013) experimentally show that taxpayers invest more (less) in a riskier asset when a tax decrease (increase) is implemented gradually rather than in one go. In a similar vein, Falsetta and Tuttle (2011) examine how expecting a tax refund or an additional tax payment affects investment decisions that themselves do not have any tax consequences. They find in an experiment that subjects entitled to claim a tax refund take significantly less risk than those who have to pay an additional tax. The influence of tax rate changes on the timing of risky investments as well as entry and exit flexibility is studied by Fahr, Janssen, and Sureth (2014). An exit option seems irrelevant for investment timing in the case of an experienced tax rate decrease, but not in the case of a tax rate increase. Building on the utility-based investment model in Fochmann and Jacob (2015), Mehrmann and Sureth-Sloane (2017) derive prospect theoretical tax effects on risk-taking. They determine tax effects biased by risk and loss aversion for different loss offset restrictions. Fochmann, Hemmerich, and Kiesewetter (2016) and Fochmann et al. (2017) experimentally examine the effect of emotions on risk-taking. Fochmann, Hemmerich, and Kiesewetter (2016) show that the more pleasant and less exciting a tax treatment is perceived to be, the greater the risky investment. Fochmann et al. (2017) provide evidence that investors do not change their risk-taking behavior as a direct consequence of changing tax rules, yet do in response to the affective perception of these different tax rules.

1.4.1.2 Tax misperception and financing decisions

To the best of our knowledge, the only study on the effect of tax misperception on financing decisions is Blaufus and Möhlmann (2014). They find in a lab experiment that the cost

of debt includes a tax aversion premium, i.e., the cost of debt is higher than the 'rational' value and higher as in a treatment where the term 'transaction cost' is used instead of 'tax.' However, this tax aversion bias disappears in the course of the experiment due to learning effects.

1.4.1.3   Tax misperception and real effort

Using household survey data, studies estimate a tax perception parameter from regressions that explain reported work effort using pre-tax and after-tax wage income as determinants. The results are heterogeneous. Rosen (1976a) and Rosen (1976b) and Brännäs and Karlsson (1996) find that the marginal tax rate is accurately perceived by taxpayers. By contrast, König et al. (1995) find an underestimation while Arrazola, Hevia, and Sanz (2000) show an overestimation of the MTR.

Another strand of literature is based on lab experiments. Hayashi, Nakamura, and Gamage (2013) find that subjects in net-equivalent treatments are less willing to work both when their wages are partitioned with positive (bonus) and with negative surcharge (tax) components. They explain this result with subjects' complexity aversion. By contrast, Fochmann et al. (2013) demonstrate that subjects work more if their wage is subject to income tax than when they receive a net-equivalent taxfree wage. A similar finding regarding work intensity is shown by Djanali and Sheehan-Connor (2012). The positive effect of taxes on real effort remains significant for high tax rates such as 50%, however the effect size decreases (Fochmann et al., 2013).[7]

The effects of complexity-induced tax misperception on work effort are studied in Sielaff and Wolf (2016), who find that the combination of multiple interdependent taxes reduces working time and work performance. Abeler and Jäger (2015) find that subjects in a complex decision environment take their previous real-effort decision as a reference point and do not adjust their decisions as much in response to new taxes as subjects in a simple decision environment. Their results point away from a rational inattention explanation because subjects are as likely to ignore large tax rate changes as they are to ignore small changes in a complex environment. Rather, the results suggest that individuals can only pay attention to a certain amount of information.

Further experiments show that tax salience has a significant effect on real effort. Blumkin, Ruffle, and Ganun (2012) demonstrate that the lower salience of a consumption tax leads to greater real effort than an economically equivalent income tax. Fochmann and Weimann (2013) graphically illustrate a progressive income tax schedule to show that an increase in tax salience reduces real effort of experimental subjects. Moreover, Weber and Schram (2017)

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[7] The reason for this positive effect is not well understood. One explanation is tax misperception because subjects take the gross wage as an anchor and integrate tax burdens incompletely or even not at all (anchor heuristic Tversky and Kahneman, 1974). An alternative explanation provided by Djanali and Sheehan-Connor (2012) is the pro-social behavior of individuals. Moreover, under the gift-exchange theory (Akerlof, 1982) workers are assumed to respond to high wage levels by increasing their effort due to positive reciprocity. Thus, even if subjects perceive the wage taxes correctly, they could positively reciprocate employers' higher gross wages by increasing their effort.

provide evidence that real effort is lower when an income tax is levied on the employer side instead of the employee side.

Finally, Kessler and Norton (2016) highlight another channel through which deviations from 'rational' tax perception affect real effort. They provide evidence that subjects are significantly more likely to work less when a decrease in net wage is due to a tax rather than due to a wage cut. The authors explain this with *tax aversion*.

1.4.1.4 Tax misperception and tax planning

There are relatively few studies that explicitly study the effect of tax misperception on tax planning.[8] Blaufus et al. (2013) provide lab experimental evidence that subjects deciding on different tax options overweight the nominal tax rate and underweight tax base extensions. Other studies show that surprisingly many people do not take advantage of obvious tax planning opportunities (Alstadsæter and Jacob, 2017; Goupille-Lebret and Infante, 2018; Kopczuk, 2007; Stephens Jr and Ward-Batts, 2004). Although it is not fully clear what ultimately triggers forgoing tax planning opportunities, from a behavioral perspective, this might be explained by the lack of visibility of tax planning options for many economic agents. Eberhartinger et al. (2020) study the impact of both interpersonal trust and trust in the government on tax bargaining between tax auditor and taxpayer. They find in a laboratory experiment that a high level of interpersonal trust between taxpayer and tax auditor leads to more concessionary behavior by the tax auditor while taxpayers show more concessionary behavior when her trust in the government is high. These findings contribute to understanding tax planning in anticipation of tax audits and under what conditions an atmosphere of trust might lead to higher compliance.

1.4.1.5 Tax misperception, consumption, and retirement savings

The effect of tax misperception on consumption decisions is shown in several (survey) experiments. The effect of tax aversion on consumption has been studied by Sussman and Olivola (2011) who show that people are willing to drive or stand in line longer for a tax-related versus a tax-unrelated discount. However, a recent replication study only partly confirms these results (Olsen et al., 2019). With respect to *tax salience*, Chetty, Looney, and Kroft (2009), Goldin and Homonoff (2013), Taubinsky and Rees-Jones (2018), and Feldman, Goldin, and Homonoff (2018) find that posting tax inclusive prices reduces consumption. Whether this effect is clearly due to tax salience and/or a confirmation bias (consumers neglect information that does not align with their consumption intentions) is, however, not fully clear (Feldman, Goldin, and Homonoff, 2018; Feldman and Ruffle, 2015). With respect

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[8] Tax misperception may also affect tax evasion since the tax rate is a standard determinant in tax evasion models (Allingham and Sandmo, 1972). Thus, less-salient taxes should reduce non-compliance (Watrin and Ullmann, 2008). Moreover, tax misperceptions also affect perceived tax fairness, another determinant of tax compliance (Kirchler, 2007). While there are tax compliance studies on the effect of misperceived tax audit probabilities, we are not aware of studies that directly address the effect of tax rate misperception on tax evasion (or a recent review of tax compliance research see Alm, 2019).

to the *framing* of tax reductions, Epley, Mak, and Idson (2006) provide lab experimental evidence that subjects spend more if a tax reduction is framed as a bonus instead of a tax rebate. Similarly, Lozza, Carrera, and Bosio (2010) find in a survey experiment that tax reductions framed as an increase in monthly income lead to more spending than if they are framed as a reduction in the monthly tax burden. The behavioral effect of the timing of taxation on consumption is mixed. In line with the assumption that individuals use mental accounting (Thaler, 1990), Chambers and Spencer (2008) find in a survey experiment that tax refunds delivered in monthly amounts stimulate current spending more than if the same yearly total tax reduction were delivered in one lumpsum payment. However, using US survey data, Sahm, Shapiro, and Slemrod (2012) find a reduction in monthly withholding tax to increase spending less than a one-time payment.

Most countries use special tax regimes to promote retirement savings via a deferred taxation of pensions which makes savings tax deductible, interest on savings tax exempt, and pensions fully taxable. However, Chetty et al. (2014) study tax return data and find that 85% of individuals are 'passive savers' who are unresponsive to subsidies. Using administrative firm data, Beshears et al. (2017) find that retirement savings are almost insensitive to the introduction of differently taxed retirement plans. Their supplemental survey results suggest that many employees are unaware of the tax treatment being applied to their savings. Thus, due to tax ignorance, subjects have lower effective savings under deferred than under immediate taxation. The lab experiments of Blaufus and Milde (2020) show that providing informational tax nudges reduces tax misperception and closes the savings gap between immediate and deferred taxed pension plans. Moreover, replacing the tax deductibility of retirement savings with government-matching contributions raises after-tax pensions above the level under immediate taxation without the need to provide informational tax nudges. Cuccia, Doxey, and Stinson (2017) find that individuals generally prefer immediate over deferred taxation and Stinson, Doxey, and Rupert (2020) report that subjects anchor on pre-tax values and thus invest in lower-risk and lower-return assets when they have specific retirement goals under deferred taxation. The effect of tax complexity on employees' decisions on company pension plans is studied in Blaufus and Ortlieb (2009). Using a survey-based conjoint analysis, the authors find that with increasing tax complexity, the proportion of subjects who base their decision on their after-tax return decreases significantly.

Summing up, Section 1.4.1 reveals that even if subjects have access to objective tax information, this information is often misperceived, leading to behavior that systematically deviates from rational choice predictions. This misperception is particularly pronounced when tax complexity is high and tax salience is low. Further, loss and tax aversion seem to explain these behavioral deviations. Moreover, tax framing and timing, too, affect misperception and thus individual decision-making.

1.4.2   Effects of Corporate Tax Mispereption on Decision Making

Studies that particularly address the effect of tax misperception on corporate decision making are rare. Graham et al. (2017) combine survey data with balance sheet and capital market

data to study the effect of corporate managers' tax misperception on investment and capital structure decisions. They find that many tax managers, in particular those working in public firms, use the GAAP ETR instead of the correct MTR for decision making. Moreover, the results suggest that as the difference between a firm's MTR and GAAP ETR increases, firms that use the GAAP ETR become less responsive to growth opportunities and adopt a suboptimal debt policy. This study is the first to provide evidence of an association between tax rate misperception and investment as well as financing inefficiency on a corporate level. It complements the experimental findings for individuals discussed in Section 1.4.1 by demonstrating that even in competitive markets and with professional decision makers, tax misperception may occur and thus inefficient investment and financing decisions are made.

Amberger, Eberhartinger, and Kasper (2016) use lab experiments to study whether subjects make tax-optimal corporate intra-group financing decisions. In line with Blaufus et al. (2013), they find that subjects under time-pressure overweight tax rate information and underweight tax base information. This holds for both students and highly experienced tax professionals.

Analyzing the usage of tax planning opportunities by corporations, Zwick (2020) reveals that only 37% of corporations that could benefit from loss carryback make use of this possibility. This indicates a substantial misperception of tax planning opportunities. Moreover, firms differ significantly regarding the speed of tax code learning, with more profitable firms learning faster (Bach, 2015).

1.5   Management of Tax Perception and its Impact on Stakeholders

Some studies show that corporations strategically avoid disclosing unpleasant tax information to manage stakeholder perception (Akamah, Hope, and Thomas, 2018; Dyreng, Hoopes, and Wilde, 2016). Other studies indicate that firms seem to report some tax information voluntarily to mitigate negative capital market reactions to missing tax information (Balakrishnan, Blouin, and Guay, 2019; Chen, Chi, and Shevlin, 2019; Flagmeier and Müller, 2019). Demeré et al. (2019) provide empirical evidence that firms smooth their GAAP ETRs. Consistently, Flagmeier, Müller, and Sureth-Sloane (2020) find that firms strategically disclose information on their GAAP ETR more visibly if their ETR is favorable from an investor's perspective (low or close to the average ratio for firms of the same industry or size group). Overall, these findings indicate that firms actively manage investors' perception in their tax disclosure strategy.

Further studies examine management of tax perception with respect to the political cost theory. This theory suggests that larger firms are exposed to greater public pressure than smaller firms and thus have higher (reported) ETRs (see e.g., Watts and Zimmerman, 1978; Zimmerman, 1983). Higher (reported) ETRs can be both a result of political costs and a tool to bias the political process. The latter is relevant in terms of firms striving to induce politicians' or voters' misperception on firms' tax burdens. According to Wong (1988), the choice of accounting method is linked to the political costs of a firm. He demonstrates that larger

corporations receiving substantial export tax credits are more likely to apply the accounting method that raises their reported ETRs. Northcut and Vines (1998) examine ETR reporting prior to the US Tax Reform Act of 1986. They find that firms with low ETRs boosted their reported tax burdens in the year prior to the reform to reduce the probability of higher taxes. Similarly, Baloria and Klassen (2017) find that corporate tax reform-supporting firms raised their ETRs prior to the 2012 US election to promote candidates who advocated for tax cuts. Moreover, consistent with the political cost argument, Chychyla, Falsetta, and Ramnath (2017) find that firms with low (high) ETRs tend to highlight the dollar (percentage) amount of their tax expense. Management of tax perception also plays a role in maintaining public contracts. Mills, Nutter, and Schwab (2013) provide evidence that politically sensitive contractors exhibit higher federal ETRs. While Wong (1988) and Northcut and Vines (1998) were able to provide clear evidence that higher ETRs result merely from tax perception management, Baloria and Klassen (2017) and Mills, Nutter, and Schwab (2013) cannot disentangle to what degree higher ETRs result from tax perception management or from higher tax payments.

Table A3 (see online appendices, see supplemental data) provides detailed information on all studies discussed in this section.

1.6 Determinants of Tax Misperceptions: Behavioral Taxpayer Response Model

In this section, we summarize the results of tax perception research by developing a *Behavioral Taxpayer Response Model* that illustrates the impact of the character of provided tax information on tax perception, whether and how the non-tax environment and individual traits moderate this relationship and finally, how the emerging tax perception translates into decisions. The model should help researchers to develop and define their own research questions and derive behavioral predictions. Figure 1.1 displays the model.

FIGURE 1.1: Behavioral taxpayer response model
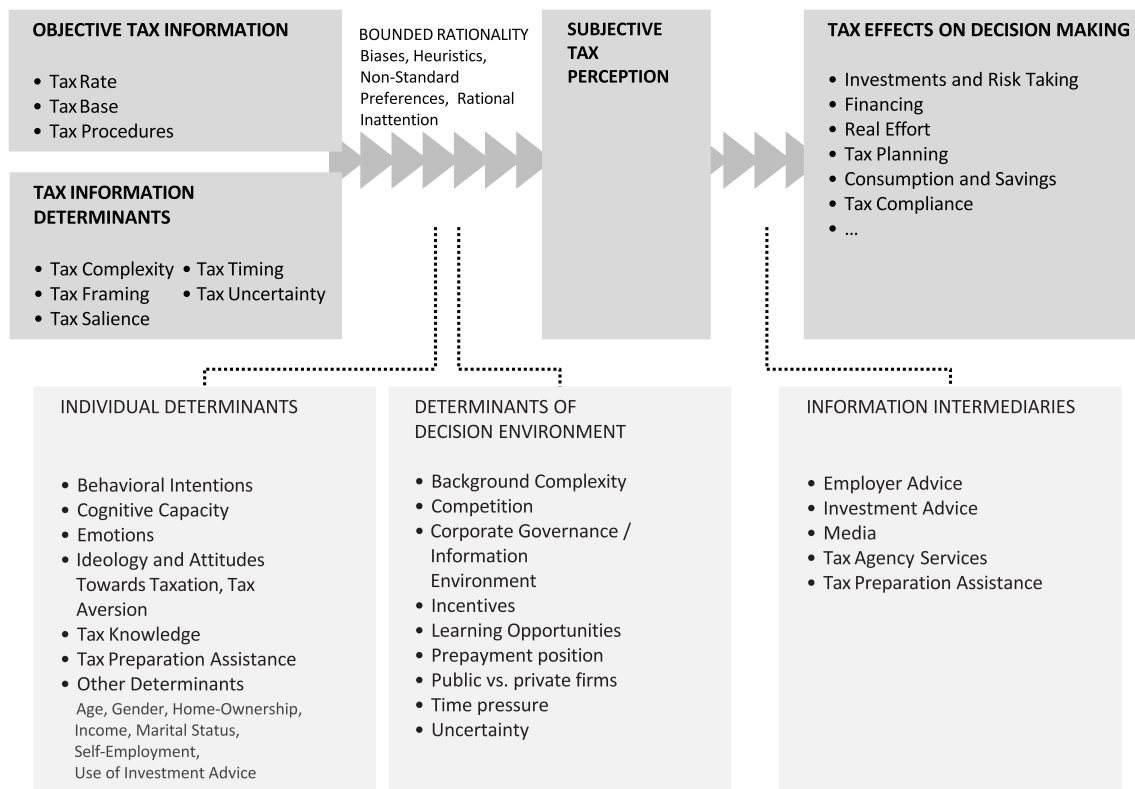
The prior sections have shown that objective tax information (about tax rates, tax base elements, and tax procedures) is not always perceived correctly by information recipients. Tax misperception exists because many subjects behave in a rationally bounded manner. They consider that purely rational choices are costly to operate in both time and cognitive strain (Simon, 1959). However, there is no single theory that explains bounded rational tax responses. Rather, several approaches coexist in behavioral economics and are employed by tax researchers. These approaches encompass the assumption that individuals use simplifying decision heuristics, are systematically subject to certain perception and decision biases, have no standard-preferences, or are rationally inattentive.

Important heuristics that drive tax misperception are the following. First, using the ironing heuristic, taxpayers linearize the tax schedule for all levels of income using their own ATR. Thus, ironers rely on a proportional tax rate schedule where their ATR determines both the overall ATR and MTR. The ironing hypothesis is supported by Bartolome (1995), Liebman and Zeckhauser (2004), Feldman and Katuščák (2006), and Rees-Jones and Taubinsky (2019). Second, using the spotlighting heuristic, individuals assume the slope of the tax schedule is equal to their own MTR over the entire income range. Liebman and Zeckhauser (2004) and Feldman, Katuščák, and Kawano (2016) provide evidence in support of the spotlighting heuristic. Third, the use of the anchor heuristic can explain biased tax effects on real effort as decision making may depend primarily on pre-tax wages (e.g., Fochmann et al., 2013).

Fourth, the use of a lexicographic heuristic can explain the observation that tax rate information is overweighted in comparison to tax base information (Blaufus et al., 2013). Fifth, subjects use rounding heuristics in estimating the tax burden (Taubinsky and Rees-Jones, 2018). Sixth, subjects use mental accounts to simplify their decision making. Thus, tax refunds administered as one lump-sum affect behavior differently from tax refunds in the same amount that are refunded monthly through reduced income tax withholding (Chambers and Spencer, 2008).

Besides the use of heuristics, research from economic psychology highlights the existence of behavioral biases that affect tax misperception. For example, subjects disregard information on sales tax because the additional tax burden contradicts their consumption intention (confirmation bias Feldman and Ruffle, 2015), or information on income tax rates is over-weighted compared to tax base information because tax rate information is generally more easily available (availability bias Blaufus et al., 2013). Some subjects have a larger disutility from paying taxes than they do if paying the same amount in other costs (tax aversion bias Blaufus and Möhlmann, 2014; Kessler and Norton, 2016; Sussman and Olivola, 2011). By contrast, other subjects have non-standard utility functions and perceive an additional positive utility from paying taxes to contribute to public goods (tax affinity Djanali and Sheehan-Connor, 2012). Non-standard utility functions may also include fairness considerations. If utility functions include fairness preferences, not only the perception of one's own tax burden but also that of others is relevant for decision making. Non-standard utility functions further encompass reference-point dependency, for example, the different valuation of gains and losses according to prospect theory (Kahnemann and Tversky, 1979). Therefore, framing tax reductions as a bonus or rebate affects decision making (Epley, Mak, and Idson, 2006).

Finally, there is some evidence that inattention to taxes decreases with the amount of the tax. This points towards a rational inattention explanation of tax misperception (Amberger, Eberhartinger, and Kasper, 2016; Taubinsky and Rees-Jones, 2018) because information is more likely to be incorporated in decision-making if ignoring it is more costly (Abeler and Jäger, 2015). However, the evidence regarding this issue is inconclusive (Abeler and Jäger, 2015; Feldman, Goldin, and Homonoff, 2018).

Because the use of heuristics and the existence of behavioral biases depend on individual traits, the properties of tax information, and the characteristics of the general decision environment, we distinguish (i) tax information determinants, (ii) individual determinants, and (iii) determinants of the decision environment. In Table 1.2, we present detailed information about these determinants, the operationalizations used in prior research, and the direction of the determinants' effect on tax misperception.

TABLE 1.2: Determinants of tax misperceptions

Panel A. tax information determinants

Tax complexity

AICPA's tax complexity index	Plumlee (2003) finds that the magnitude of errors in ETR forecasts increases with the complexity of tax law changes.
Combination of multiple interdependent taxes	Increases tax misperception, reduces working time and performance (Sielaff and Wolf, 2016).
Proportion of assets in foreign locations	Firms with a large proportion of their assets in foreign locations are less likely to use the MTR for decision-making (Graham et al., 2017).
Tax Complexity Index (TCI)	Hoppe et al. (2019) find that tax framework complexity is negatively associated with countries' governance, suggesting that strongly governed countries show lower levels of tax misperception. By contrast, tax code complexity is found to be positively associated with the statutory tax rate, indicating that high-tax countries' tax code fuel tax misperception.
Tax rate complexity factor	Bratten et al. (2017) find that the accuracy of managers' and analysts' ETR forecasts decreases when tax rate complexity (capturing absolute changes in ETR, the absolute difference between STR and ETR, and ETR volatility) is high.
Tax rate information, floors and phase-outs	Increasing tax complexity increases the probability of erroneous investment decisions (Boylan and Frischmann, 2006; Rupert, Single, and Wright, 2003; Rupert and Wright, 1998).
Time needed for understanding the tax rules	With increasing tax complexity, the proportion of subjects that make tax-optimal decision decreases significantly (Blaufus and Ortlieb, 2009).

Tax framing

Prospect theory	The framing of a tax reduction as a bonus instead of a tax rebate or as increase in monthly income instead of a reduction of the monthly tax burden affects spending behavior (e.g., Epley, Mak, and Idson, 2006). Fahr, Janssen, and Sureth (2014) find that the presence of an exit option seems to be irrelevant for (affects) investment timing in the case of an experienced tax rate decrease (increase). Mehrmann and Sureth-Sloane (2017) analytically show that tax loss offset restrictions significantly bias investor perception even more heavily than the tax rate.
Tax labels	Different labels for taxes can affect the perceived tax burden (Hundsdoerfer et al., 2013; Löfgren and Nordblom, 2009). The label 'tax' itself can affect the perceived burden of tax averse subjects (Blaufus and Möhlmann, 2014; Kessler and Norton, 2016; Sussman and Olivola, 2011).
Format of tax information	Tax burdens assessed in dollars rather than rates are significantly less progressive (Hite and Roberts, 1991; McCaffery and Baron, 2003) and subjects presented with ETR information in a percentage format make more accurate tax expense forecasts than do subjects presented with the information in a dollar format (Chychyla, Falsetta, and Ramnath, 2017).

Tax salience

Direct vs. indirect taxes	Higher tax misperception for indirect taxes (Blumkin, Ruffle, and Ganun, 2012; Sausgruber and Tyran, 2005).
Graphical illustration of progressive tax schedule	Reduces tax misperception (Fochmann and Weimann, 2013).
Payment method	Less salient payment methods increase property tax misperception (Cabral and Hoxby, 2012) and toll payment misperception (Finkelstein, 2009). Income tax perception depends on whether the tax is levied on the employer side or the employee side (Weber and Schram, 2017). The point of tax collection also affects the economic incidence of tax (Morone, Nemore, and Nuzzo, 2018).
Tax inclusive vs. exclusive prices	Tax inclusive prices reduce demand (Chetty, Looney, and Kroft, 2009; Goldin, 2012; Taubinsky and Rees-Jones, 2018).
Tax timing	Tax refunds administered in one lump sum are less likely to be spent than monthly tax refunds of the same amount through reduced income tax withholding (Chambers and Spencer, 2008). However, this finding is not confirmed by Sahm, Shapiro, and Slemrod (2012). Falsetta, Rupert, and Wright (2013) show that taxpayers invest more (less) in a riskier asset when there is a tax decrease (increase) that is implemented gradually rather than all at once.
Tax uncertainty	Increases tax misperception (e.g., Bratten et al., 2017).
Panel B: individual determinants	
Behavioral intentions	Due to a confirmation bias, consumers neglect tax information that does not align with their consumption intentions (Feldman, Goldin, and Homonoff, 2018; Feldman and Ruffle, 2015).
Cognitive capacity	
Education	A positive association between education and accuracy of tax perception is demonstrated by Gensemer, Lean, and Neenan (1965), Williamson (1976), Slemrod (2006), Blaufus et al. (2015), and Amberger, Eberhartinger, and Kasper (2016), while other studies find no statistically significant effect of education (Ballard and Gupta, 2018; Fujii and Hawley, 1988; Gideon, 2014).
Management ability	The speed at which tax planning opportunities are identified correlates with the ability of corporate management to generate higher returns (Bach, 2015).
Numerical intelligence	Decreases ATR misperception, but has no effect on MTR misperception (Gideon, 2014).
Social class	Lewis (1978) finds social class and the accuracy of MTR estimates being positively associated.
Emotions	Fochmann, Hemmerich, and Kiesewetter (2016) show that the more pleasant and less exciting a tax treatment is perceived, the higher the amount that is riskily invested. Fochmann et al. (2017) provide evidence that investors do not change their risk taking behavior as a direct consequence of changing tax rules but due to the affective perception of these different tax rules.

Ideology and attitudes	Lewis (1978) and Slemrod (2006) report no association between political party affiliation and tax misperception. Ballard and Gupta (2018) find the same for ideology while Williamson (1976) finds weak explanatory power for ideology. Ballard and Gupta (2018) report more pronounced tax rate overestimates by respondents who either regard people like themselves being taxed too high or who assume that taxes are spent ineffectively. Republican respondents perceive that taxes are higher and more progressive than Democrats do (Stantcheva, 2020). Sussman and Olivola (2011), Blaufus and Möhlmann (2014), Kessler and Norton (2016) show that some individuals dislike tax payments more than equivalent costs. Fochmann and Kleinstück (2014) do not find tax averse behavior.
Tax knowledge	
Accounting education	Graham et al. (2017) finds a negative effect for accounting related education of corporate tax managers on tax rate misperception.
Factual tax questions	Slemrod (2006) finds no association between tax knowledge and misperception of tax schedule progressivity.
Firm size, high-R&D-intensity firms	Graham et al. (2017) assume that larger firms and high R&D-intensity firms are likely to have greater tax compliance activities and/or greater tax planning opportunities, which leads them to employ well-trained tax personnel. They find that the likelihood of using the MTR for decision-making (instead of the ETR) increases with firm size and high R&D-intensity.
Investment activity	Decreases misperception of MTRs (Gensemer, Lean, and Neenan, 1965).
Occupation in banking, insurance, stock brokerage, and accountancy	Decreases misperception of MTRs (Gensemer, Lean, and Neenan, 1965).
Self-rated familiarity with the federal income tax rate structure	In contrast to other studies, Rupert and Fischer (1995) find increasing tax misperception of the MTR when subjects state that they have extensive tax knowledge.
College degree in economics/ law, having parents who run a business	Alstadsæter and Jacob (2017) show that having a college degree in economics or law and having parents who run a business is positively associated with the use of tax planning options.
Years of experience as analysts	Decreases misperception of tax-related information (Weber, 2009).
Tax preparation assistance	Using tax preparation assistance is positively correlated with tax rate misperception (Ballard and Gupta, 2018; Gideon, 2014; Rupert and Fischer, 1995).
Other variables	
Age	According to Gideon (2014), Ballard and Gupta (2018) and Feldman, Katuščák, and Kawano (2016), age is negatively associated with tax misperception, while Lewis (1978) finds more accurate estimates only for middle-aged individuals. By contrast, Blaufus et al. (2015) report more pronounced misperception among elderly people of their MTR and Slemrod (2006) of tax rate schedule progressivity.

Gender	Gender does not play a role in tax misperception, according to Gideon (2014), Ballard and Gupta (2018), and Fujii and Hawley (1988). Blaufus et al. (2015) find a gender effect only for overestimates, which are more pronounced for men. Slemrod (2006) reports that men underestimate tax schedule progressivity far more than women.
Home ownership	While Fujii and Hawley (1988) find a negative association with tax misperception, Ballard and Gupta (2018) find no significant association.
Income	A positive association between income and accuracy of estimates is confirmed by Rupert and Fischer (1995), Ballard and Gupta (2018), Williamson (1976) and Feldman, Katuščák, and Kawano (2016), whereas Blaufus et al. (2015) show income and underestimates of own MTRs to be associated.
Marital status	Slemrod (2006) and Gideon (2014) find no correlation, whereas Ballard and Gupta (2018) indicate more overestimates among married respondents.
Self-employment	Feldman, Katuščák, and Kawano (2016) show that self-employment reduces tax misperception, while Schmölders (1960) reports the opposite. Blaufus et al. (2015) find no significant association.
Use of investment advise	Negative correlation with tax misperception (Rupert and Fischer, 1995).

Panel C: determinants of the decision environment

Background complexity	The initial tax complexity of a decision environment increases misperception of subsequently introduced new, simple taxes (Abeler and Jäger, 2015).
Competition	Firms operating in environments with greater product market competition are more likely to use the MTR (instead of the ETR) for decision making (Graham et al., 2017). Boylan and Frischmann (2006) and Blaufus and Möhlmann (2014) show that tax-related decision errors persist in competitive market settings but diminish over time.

Corporate governance / information environment

Implementation of XBRL	Reduces analysts' misperception of tax-based earnings information (Kim, Schmidt, and Wentland, 2020).
Institutional ownership	Firms with high institutional ownership are more likely to use the MTR (instead of the ETR) for decision-making (Graham et al., 2017). Tax related forecasts errors decrease with increasing institutional ownership (Kim, Schmidt, and Wentland, 2020).
No. of analysts following the firm	Reduces tax related forecasts errors (Kim, Schmidt, and Wentland, 2020; Weber, 2009).

Incentives	Increasing incentives reduce tax misperception. Firms are less likely to use the STR for decision making when the difference between the MTR and STR is larger (Graham et al., 2017). Goldin and Homonoff (2013) find that only low-income consumers respond to changes in cigarette taxes, Amberger, Eberhartinger, and Kasper (2016) observe that the share of tax-minimizing decisions increases the larger the tax burden difference between two options. Taubinsky and Rees-Jones (2018) show that increasing sales tax rates reduce misperception. By contrast, Abeler and Jäger (2015) and Feldman, Goldin, and Homonoff (2018) do not find that tax misperception decreases with increasing tax rates.
Learning Opportunities	Feedback from other market participants and learning by doing reduce tax-related decision errors/biases (Blaufus et al., 2013; Blaufus and Milde, 2020; Blaufus and Möhlmann, 2014; Boylan and Frischmann, 2006; Rupert and Wright, 1998).
Prepayment position	Taxpayers who owe taxes make greater errors in estimating their MTR than those who are entitled to a refund (Rupert and Fischer, 1995).
Public vs. private firms	According to Graham et al. (2017), public (private) firms are more likely to use the ETR (STR) instead of the MTR for decision-making, A stronger capital market focus (measured by the number of analysts following the firm) increases the likelihood of the ETR (instead of the correct MTR) being used for decision making (Graham et al., 2017).
Time pressure	Time pressure increases tax misperception (Amberger, Eberhartinger, and Kasper, 2016).
Uncertainty	Uncertainty related to the decision environment affects tax misperception, for example via loss-offset misperception (Fochmann, Kiesewetter, and Sadrieh, 2012b; Fochmann, Kiesewetter, and Sadrieh, 2012a).

Notes: This table gives an overview of findings on individual and tax information determinants and determinants of the decision environment.

First, regarding *tax information determinants* (Panel A of Table 1.2), previous research has found that misperception of objective tax facts increases with decreasing salience (Blumkin, Ruffle, and Ganun, 2012; Cabral and Hoxby, 2012; Chetty, Looney, and Kroft, 2009; Finkelstein, 2009; Goldin, 2012; Sausgruber and Tyran, 2005; Taubinsky and Rees-Jones, 2018; Weber and Schram, 2017). The salience of taxes may depend on who is obliged to pay the tax, on whom the tax is levied (direct taxes, indirect taxes, withholding taxes), the payment mechanism (individual transfer, electronic collection), and whether taxes are displayed (prices with/without sales tax).

In addition, tax complexity has been shown to increase tax misperception. It reduces real effort (Sielaff and Wolf, 2016) and increases the probability of erroneous investment decisions (Boylan and Frischmann, 2006; Rupert, Single, and Wright, 2003; Rupert and Wright, 1998). In complex tax systems, many subjects base their decisions on pre-tax variables (Blaufus and Ortlieb, 2009). Tax complexity also affects corporate tax misperception. Graham et al. (2017) report that firms with a large proportion of assets in foreign locations (making it very

complex to calculate the correct MTR) are less likely to use the MTR for decision making. Furthermore, Bratten et al. (2017) find that the accuracy of managers' and analysts' ETR forecasts decreases when tax rate complexity is high.

Tax framing is another tax information determinant that affects decision making. Empirical results suggest that the label 'tax' itself may be negatively perceived by tax averse individuals and that changing the label of a tax affects its perceived burden (e.g., Hundsdoerfer et al., 2013; Kessler and Norton, 2016; Löfgren and Nordblom, 2009). Also, the framing of a tax reduction as a bonus instead of a rebate seems to influence spending behavior (e.g., Epley, Mak, and Idson, 2006). Furthermore, the format of tax information affects perception. Normative assessments of tax progressivity differ when expressed in tax rates or in dollar amounts. Tax burdens assigned in dollars rather than in tax rates are significantly lower (Hite and Roberts, 1991; McCaffery and Baron, 2003); subjects presented with ETR information in percentage format make more accurate tax expense forecasts than subjects who are presented with a dollar format (Chychyla, Falsetta, and Ramnath, 2017). In addition, tax timing influences tax perception (Chambers and Spencer, 2008; Falsetta, Rupert, and Wright, 2013) when subjects use mental accounts (Thaler, 1990) or have prospect theoretical utility functions (Kahnemann and Tversky, 1979). Finally, tax uncertainty may increase tax misperceptions (e.g., Bratten et al., 2017).

Second, to what extent objective tax information is perceived accurately depends on a number of individual determinants that moderate the effect of tax information on the subjective tax burden and thus on tax-related decision making (Panel B of Table 1.2). Because the use of heuristics and the existence of behavioral biases are usually negatively associated with knowledge and cognitive capacity, it is not surprising that most studies find that tax misperception decreases with better tax knowledge and higher cognitive capacity. This negative effect on tax misperception has been found for individual taxpayers (Blaufus et al., 2015; Gensemer, Lean, and Neenan, 1965; Gideon, 2014; Slemrod, 2006; Williamson, 1976), in a corporate context (Alstadsæter and Jacob, 2017; Amberger, Eberhartinger, and Kasper, 2016; Bach, 2015; Graham et al., 2017) and for financial analysts (Weber, 2009).

In addition to tax knowledge and cognitive capacity, a variety of other individual moderators determine the perception of tax information. If tax information is in conflict with their own behavioral intentions, individuals may ignore or underweight this information due to a confirmation bias (Feldman, Goldin, and Homonoff, 2018; Feldman and Ruffle, 2015). Emotions, too, can affect tax perception, particularly in risky investment decisions (Fochmann, Hemmerich, and Kiesewetter, 2016; Fochmann et al., 2017).

Other individual traits that have been examined as potential determinants of tax misperception include age, gender, ideology, and attitudes towards taxation, income, home-ownership, marital status, and self-employment. Most studies find that tax misperception decreases in income due to higher rewards from tax planning, which makes it more attractive to learn more about tax laws. Concerning the other mentioned variables, the evidence is, however, inconclusive (see Table 1.2, Panel B for detailed references).

Third, besides characteristics of the tax information and traits of the decision maker, the general decision environment also shapes the extent of tax misperception (see Panel C of Table 1.2). If the decision environment is already very complex, the probability of additional tax information being misperceived increases (Abeler and Jäger, 2015). Moreover, learning opportunities and competition are important debiasing tools. Firms operating in environments with greater product market competition are more likely to use the correct MTR for decision-making (Graham et al., 2017). Boylan and Frischmann (2006) and Blaufus and Möhlmann (2014) show that tax-related decision errors persist, but diminish over time in competitive market settings. In repetitive decisions, subjects often have the opportunity to learn and reduce tax misperception, which is not possible with one-off or irregularly occurring decisions (Blaufus et al., 2013; Blaufus and Milde, 2020; Blaufus and Möhlmann, 2014; Rupert and Wright, 1998). Social networks, peers, media attention, and the relationship with the tax authorities also shape the environment that constitute individual beliefs (and managers' beliefs McGuire, Omer, and Sharp, 2012) and ultimately coin (corporate) taxpayers' attitude towards taxes and tax planning (Hasan et al., 2017).

According to rational inattention models, increasing incentives should reduce tax misperception. Supporting evidence stems from Goldin and Homonoff (2013), Amberger, Eberhartinger, and Kasper (2016), Graham et al. (2017), and Taubinsky and Rees-Jones (2018). Graham et al. (2017) find that firms are less likely to use the statutory tax rate (STR) instead of the correct MTR for decision-making when the difference between the MTR and STR increases. Goldin and Homonoff (2013) show that only low-income consumers respond to changes in less salient cigarette taxes. Amberger, Eberhartinger, and Kasper (2016) observe that the share of tax-minimizing decisions increases in the tax burden difference between two options, and Taubinsky and Rees-Jones (2018) show that increasing sales tax rates reduce tax misperception. By contrast, Abeler and Jäger (2015) and Feldman, Goldin, and Homonoff (2018) do not find that tax misperception decreases with increasing tax rates.

There is some evidence that time pressure increases tax misperception (Amberger, Eberhartinger, and Kasper, 2016) and that the prepayment position matters for tax perception. Taxpayers who owe taxes seem to make greater errors in estimating their MTR than those who are entitled to a refund (Rupert and Fischer, 1995). Lastly, an uncertain decision environment affects tax misperception, too (e.g., Fochmann, Kiesewetter, and Sadrieh, 2012b; Fochmann, Kiesewetter, and Sadrieh, 2012a).

In a corporate context, two further moderators are relevant to tax misperception. First, there seems to be a difference between private and public firms due to differences in the salience of tax information. In line with the assumption that the GAAP ETR (STR) is particularly salient for managers of public (private) firms, Graham et al. (2017) show that public (private) firms are more likely to use the GAAP ETR (STR) instead of the correct MTR for decision making. Thus, a capital market focus may favor tax misperception due to the concentration on accounting-related tax information (GAAP ETR) instead of the decision-relevant MTR. Second, the level of corporate governance and the quality of the firm's information environment reduce tax misperception. Firms with strong institutional ownership are more likely to

use the MTR for decision making (Graham et al., 2017). Tax related forecasts errors decrease with increasing institutional ownership (Kim, Schmidt, and Wentland, 2020) and increasing numbers of analysts following a firm (Kim, Schmidt, and Wentland, 2020; Weber, 2009).

If taxpayers' subjective tax burden deviates from the objective burden and they make their decisions without the help of information intermediaries, tax responses deviate from rational choice predictions. However, if subjects follow unbiased advice from their employer, investment advisory firms, the media, the tax agency, or professional tax advisors, their own tax misperception does not translate into decision errors.[9] Thus, we consider the use of information intermediaries as a moderator of the relationship between tax information and behavioral tax responses in the *Behavioral Taxpayer Response Model*. In line with this, Zwick (2020) shows that sophisticated tax preparers reduce non-optimizing tax decisions of corporations.

In sum, the presented model shows that tax misperception is a function of specific individual traits, tax information characteristics, and properties of the decision environment. Moreover, whether tax misperception translates into tax-related decision errors depends on the availability and use of unbiased tax advice.

1.7   Open Research Question

Each section of our review has revealed several open research issues. Regarding individual and corporate tax misperception (Section 1.3), we observe that researchers use different approaches to measure tax misperception but there is no research that compares these approaches with respect to the extent of measured tax misperception. Moreover, we are not aware of studies that conduct cross-country comparisons, compare misperceptions across different kind of taxes, or directly measure corporate managers' misperception of tax rates or tax burdens.

With respect to the effects of tax misperception on decision making (Section 1.4), we identify open research issues concerning non-business, business, and corporate decision making. While much behavioral tax research focuses on non-business decisions, surprisingly we find almost no research on the effect of tax misperception on typical household finance decisions such as housing, the realization of capital gains, or private portfolio decisions. Regarding business decisions, the reviewed research has mainly studied the effect of tax misperception on investment and risk-taking decisions. By contrast, there is a dearth of research on the effect of tax misperception on other business decisions such as the choice of organizational form, employment, financing, location choice, production, supply chain, and tax planning. Regarding decision-making of corporate managers, our knowledge is particularly limited.

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[9]   Unbiased advice could also serve as a source of information and thereby decrease taxpayers' tax misperception. However, prior evidence reveals that using tax preparation assistance is positively correlated with tax misperception (Ballard and Gupta, 2018; Gideon, 2014; Rupert and Fischer, 1995). This suggests that taxpayers who seek tax advice delegate their tax affairs to experts without building up their own expertise. In line with this, research shows that taxpayers seek tax advice even if the resulting tax savings are lower than the fees paid to preparers to reduce tax uncertainty and cope with the inherent tax complexity (Blaufus, Hechtner, and Möhlmann, 2017).

In addition to the already mentioned business decisions which should also be examined on a corporate level, future research should also address how corporate tax misperception affects accounting choices, the type and implementation of tax risk management systems, usage of tax uncertainty shields, and participation in voluntary co-operative tax compliance programs.

In terms of both the occurrence and magnitude of tax misperception and its impact on decision making, there is a research gap regarding the misperception of the tax burden of others. Behavioral tax compliance research suggests that there are spill-over effects on one's own economic decisions (e.g., Blaufus et al., 2017; Lefebvre et al., 2015). Meanwhile, studies in accounting have revealed many roles of peers in explaining firm behavior (see Bird, Edwards, and Ruchti, 2018, for tax planning activities). However, studies on the effect of corporate misperception of peers' tax burden are missing. One could expect these spill-over effects to concern other decisions, too, such as both individual and corporate manager decisions and especially real effort, compliance, and investment decisions, yet also decisions on tax planning or location choices.

Another research gap concerns the management of tax misperception by corporations and its impact on stakeholders (Section 1.5). For example, we know little about how firms manage ax accounting information and its disclosure to influence stakeholders' perception of the firms' tax burden. Regarding the determinants of tax misperception (Section 1.6), we identify several research questions that encompass the optimal design of tax information to reduce tax misperception or to foster investment or savings decisions, the determination of firm characteristics that influence tax misperception, the effect of incentive schemes on tax misperception, and the effect of information intermediaries on tax misperception and tax-related decision errors. We provide a detailed overview of open research issues and provide a comprehensive but at the same time non-exhaustive list of open research questions. We structure these research questions along the topics of this literature review (occurrence and magnitude of individual and corporate tax misperception, effects of tax misperception on decision making, management of tax misperception and its impact on stakeholders, determinants of tax misperception) in Table 1.3.

TABLE 1.3: Open research issues.

1. Individual and corporate tax misperception (occurence and magnitude)	
GENERAL	How does the measurement method affect the magnitude of tax misperception?
	Does tax misperception differ across countries?
	Does the misperception of the absolute and relative tax burden (tax burden distribution) vary?
CORPORATE	To what extent do corporate managers misperceive tax rates?
	Do corporate managers misperceive different tax rates (ETR vs. MTR) differently?
	Do corporate managers misperceive the tax burden of their peers?
2. Effect of tax misperception on decision making	
NON-BUSINESS	How does tax misperception affect housing decisions?

	How does tax misperception affect the realization of capital gains?
	How does tax misperception affect portfolio selection?
	What explains the different results regarding tax misperceptions on risk-taking?
	What behavioral channel explains the positive effect of taxes on real effort despite net equivalent payoffs?
	How does misperception of peers' tax burden affect non-business decisions?
BUSINESS	How does tax misperception affect the choice of organizational form?
	How does tax misperception affect employment decisions?
	How does tax misperception affect financing decisions?
	How does tax misperception affect investment decisions?
	How does tax misperception affect location decisions (within a country and cross-border)?
	How does tax misperception affect production and supply chain decisions?
	How does tax misperception affect tax planning decisions?
	How does misperception of peers' tax burden affect business decisions?
CORPORATE	How does tax misperception affect employment decisions?
	How does tax misperception affect investment decisions?
	How does tax misperception affect financing decisions?
	How does tax misperception affect location decisions (within a country and cross-border)?
	How does tax misperception affect payout decisions?
	How does tax misperception affect production and supply chain decisions?
	How does tax misperception affect tax planning decisions?
	How does tax misperception affect the type and implementation of tax risk management systems?
	How does tax misperception affect usage of tax uncertainty shields (ATR, APA)?
	How does tax misperception affect participation in voluntary cooperative compliance programs?
	How does tax misperception of non-profit taxes affect decisions at corporate level (property tax, inheritance tax, excise tax)?
	How does tax misperception affect tax accounting choices?
	How does misperception of peers' tax burden affect corporate decisions?

3. Management of tax perception and its impact on stakeholders

	Can firms exploit consumers' tax misperception by implementing 'tax-free' advertising campaigns?
	Which forms of information provision do firms use to manage their tax disclosures (texts, graphs, tables, numbers, notes)?
	Which channels of information provisions do firms use to man- age their tax disclosures (annual reports, investor conferences and road shows, media, social media)?
	How do firms manage their tax disclosures to influence their stakeholders (customers, workforce, investors, tax authorities, regulatory bodies, politicians)?
	Which accounting systems do firms use to generate the numbers required by (mandatory) tax reporting (local GAAP, IFRS, managerial accounting numbers)?
	Do firms manage tax misperception via tax expenses (e.g., accruals management) or deferred taxes?

4. Determinants of tax misperceptions (Behavioral Taxpayer Response Model)

TAX INFORMATION	How should tax information be designed and distributed to reduce misperception?
	How should tax disclosures in financial accounting be designed to improve the accuracy of tax perceptions?
	Do information interventions such as the display of the individual ATR and MTR in tax assessment notes (as is common in some countries) improve the accuracy of tax perception?
	To what extent do increased tax transparency rules (country- by-country reporting, FIN 48/IFRIC 23, DAC6) affect the tax misperception of corporate stakeholders (investors, financial analysts, revenue agents, consumers)?
	What is the relationship between tax uncertainty and tax misperception?
	What is the relationship between tax code/framework complexity and tax misperception?
	How should tax incentives to increase retirement savings be designed from a behavioral taxation perspective?
	How should tax incentives to foster investment be designed from a behavioral taxation perspective?
INDIVIDUAL	How does individuals' or corporate managers' attitude towards the government affect tax misperceptions (trust, political attitudes, prior experiences with government bodies)?
	To what extent do tax misperception depend on firm/corporate characteristics?
ENVIRONMENT	To what extent does corporate managers' tax misperception depend on incentive schemes?
	To what extent does corporate managers' tax misperception depend on their relative position and power in the organization?
	To what extent does corporate managers' tax misperception depend on being active in industry specific networks (lobbyism)?
	How does the implementation and kind of tax risk management system affect tax misperception?
	Is tax misperception during crises any different?
INTERMEDIARIES	Do tax advisors provide biased tax information and what drives the direction and magnitude of biases?
	Does the use of tax software affect tax misperceptions?
	Do the media provide biased tax information and what drives the direction and magnitude of biases?
	Do employers provide accurate tax information?
	Do investment advisors provide accurate tax information?

Notes: This table gives an overview of findings on individual and tax information determinants and determinants of the decision environment.

1.8 Conclusion

The surveyed research demonstrates that many taxpayers suffer from substantial tax misperception. They have no accurate knowledge of either their average or their marginal tax rate. The estimates for the percentage of taxpayers who largely accurately perceive their income tax rate range from under 10% to 44%. Moreover, most studies report that subjects overestimate their ATR although the direction of misperception seems to depend on the income level. Regarding the MTR, over- and underestimations are observed, with some

taxpayers (including corporate managers) mistaking ATRs for MTRs, which leads to an underestimation of the progressive tax schedule. In addition, even if accurate tax information is provided, taxpayers often do not incorporate taxes into their decision making in a way predicted by rational choice theory. Thus, tax misperception results from two sources: (i) lack of tax knowledge and (ii) misapplication of tax information in decision making. The reason for this tax misperception is that many subjects behave in a rationally bounded manner, i.e., they consider that purely rational choices require much time and cognitive effort to operate. To account properly for tax misperception in research, we develop the *Behavioral Taxpayer Response Model* which can be employed for both theoretical and empirical research to customize misperception (determinants and effects) for the underlying research question. Based on the assumption of taxpayers' bounded rationality, this model systematizes prior research on the determinants of tax misperception with respect to (i) tax information determinants, (ii) individual determinants, and (iii) determinants of the decision environment.

We identify numerous opportunities for future research (see Table 1.3). The most obvious research gap concerns limited knowledge regarding tax misperception of corporate managers and its effect on corporate decision making. While the results of individual choice experiments may be descriptive for small businesses, such as sole proprietorships or small corporations, one should be cautious when translating these results directly to the context of large corporations with professional tax management. Future research should therefore follow and extend the studies of Graham et al. (2017) and Zwick (2020). This research gap is surprising, as it is important to understand the sender-receiver paradigm of tax relevant information both as disclosed by taxpayers and as provided by regulators and monitoring bodies.

It is noticeable that previous research offers a variety of different theoretical explanations for tax misperception. However, often the concrete behavioral channel is not clearly identified. Instead, most economic studies simply assume a misperception parameter but still use a standard neoclassical decision model to explain behavior. Sometimes this raises problems in determining whether the observed effect is due to tax misperception or due to the wrong specification of the decision model. This holds true especially for the effects of tax misperception on real effort, but could also explain the inconclusive results concerning the effects on risk taking. Future research therefore needs to further improve the identification strategy. Moreover, despite emphasizing the importance of perception heterogeneity, many experiments still determine only average treatment effects which often mask heterogeneous tax responses.

Regarding the applied empirical methodology, we observe a dominance of experimental and survey studies. Due to the high internal validity of experiments, these studies allow causal inferences. However, experiments are limited to very simplified tax rules and relatively low economic incentives. In particular, accounting researchers could build on previous economic tax experiments by adding more institutional details. By contrast, surveys allow for collecting data on representative samples but offer lower internal validity and suffer from a lack of economic incentives. To overcome limitations concerning internal or

external validity, a mixed-method approach combining surveys, experiments, and archival data analyses seems very promising. Thus, we encourage future research to pursue this avenue to help substantiate ongoing international tax policy debates and better understand the impact of tax misperception on entrepreneurial and corporate decision making.

2 Firms' Tax Rate Misperception: Measurement, Drivers, and Distortionary Effects

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Abstract

Decisions-makers in firms are expected to use perceived rather than *actual tax rates* and hence their decisions can be substantially biased by misperception. We quantify firms' misperception of their average tax rate (ATR) and marginal tax rate (MTR) and identify drivers of this tax rate misperception. Using survey data on German firms, we find that the share of firms considerably misperceiving their ATR and MTR exceeds 65% and 57% respectively. Further, we illustrate firms' impaired comprehension of the tax schedule reflected by the relation between ATR and MTR. We find sole proprietorships and partnerships on average considerably overestimate their ATR anchoring at the top marginal tax rate. While corporations show no uniform tax misperception patterns for retained profits, they tend to strongly underestimate ATRs and MTRs on distributed profits. Irrespective of the legal form, we find misperception is mainly driven by tax regime complexity, lack of tax knowledge and dissatisfaction with the tax system. Surprisingly, even though many firms report using the ATR instead of the appropriate MTR in their investment and financing decisions, which suggests that they underestimate their tax burden, this bias is partially attenuated by their ATR misperception. Overall, our findings demonstrate that policymakers and researchers can benefit from incorporating firms' tax rate misperception when estimating firms' tax response and evaluating tax policies.

2.1   Introduction

This study investigates the extent and drivers of firms' tax rate misperception. Identifying and quantifying misperception in firms is crucial for understanding how tax rate misperception affects firms' business decisions, e.g., investment decisions. Former studies on the effects of taxes on decision-making refer to *actual tax rates* (e.g., Dobbins and Jacob, 2016; MacKie-Mason, 1989; Graham, 1996; Faccio and Xu, 2015), and abstract from potential tax misperception in firms. This is surprising, as the literature on individuals demonstrates that, first, the perception of taxes influences behavior and, second, tax-related misperception is a common phenomenon (see Blaufus et al., 2022, for an overview). As decision-makers are expected to refer to perceived tax rates, which might considerably deviate from *actual tax rates*, misperception could significantly bias behavior. Moreover, if tax rate misperception shapes decisions in firms, for example when tax depreciation benefits that are supposed to stimulate the economy are underestimated, the effects of tax reforms may be very different or even contrary to what has been expected by policymakers. Gallemore et al. (2021), for instance, show that firm-specific tax policy expectations shape corporate investments rather than actual implementation of tax reforms. For firms, tax rate misperception is likely to induce several kinds of biased decisions such as investment, financing or location decisions. Against this background, it is important to understand in what direction and to what extent firms misperceive tax rates and which tax rate they use in decision-making.

We define tax rate misperception as the deviation of *reported tax rates* from *actual tax rates* relying on our survey evidence. This approach enables us to measure the extent of tax rate misperception and examine the heterogeneity of misperception with respect to the share of misperceiving firms, and the share of over- and underestimating firms. Also, and to alleviate undesired misperception, understanding the drivers of and which types of firms are particularly exposed to tax rate misperception is crucial. Further, we investigate the relationship between estimated ATRs and MTRs in general and depending on the characteristics of the underlying firms (such as legal form and size). At the same time, we analyze whether firms incorporate their ATR or MTR in their decision-making process, as tax rates are among the fundamental parameters to be considered in almost every business decision (Graham, 2003). Finally, we analyze the interplay of tax rate misperception and tax rate choice in firms' decision-making.

To understand the heterogeneity in firms' misperception we use a large sample that covers firms of different size and legal form and includes small or medium sized firms (SMEs). In a first step, we collect data on firms' reported ATRs and MTRs by using a web-based survey on German firms. In a second step, we determine the *actual tax rates* of the surveyed firms as a reference point. Ideally, *actual tax rates* would be obtained from tax return data; Gideon (2014, p. 1) calls this approach the 'gold standard measure'. Unfortunately, tax return data is not available due to data protection restrictions and we refrained from asking the responding managers and owners for the necessary tax information of their firm since

answers could be noisy as self-reported profits might be erroneous and tax-relevant information is often unknown to them. Further, respondents might be reluctant to reveal this private information which then would result in non-response. We use an indirect approach to avoid these problems. We ask our respondents to estimate their firm's ATR and MTR for a *given profit* which mimics their firm's profit. We estimate a firm's profit based on firm characteristics provided in the survey and calculate the corresponding tax burden, which allows us to determine *actual tax rates* by applying the tax schedule to the *given profit*. In case of sole proprietorships and partnerships, we additionally employ personal characteristics to account for *Additional Income* and *Special Expenses* that affect them firms' progressive income tax rate.

Our results show that firms considerably misperceive their tax rates. If we regard *reported tax rates* accurate that do not deviate more than within ±5 percentage points (pp) from the *actual tax rate* ("no misperception"), we still find that more than 65% (57%) of our firms misperceive their ATR (MTR). In general, sole proprietorships and partnerships estimate their MTRs more accurately than their ATRs and show a rather uniform pattern of misperception: ATRs are considerably overestimated, while MTRs are underestimated on average. Consistent with our expectations based on the rather simple flat tax on corporate profits, corporations are better at estimating their tax rates on retained earnings. Here, only slightly more than 40% of the corporations misperceive their ATR and MTR by more than ±5pp. The share of ATR and MTR over- and underestimating corporations is about equal. However, a very different picture emerges when analyzing the tax rates on distributed profits where shareholder taxation comes into play: Corporations tend to severely underestimate tax rates and the share of ATR and MTR misperception rises to over 60%, presumably due to higher tax complexity introduced by the additional shareholder taxation. Another surprising finding is that about 25% (37%) of corporations do not know their ATR on retained profits (distributed profits) is equal to their MTR, despite the existence of a flat tax for corporations. To examine the influence of firm and personal characteristics, we conduct regression analyses. We find that in addition to tax system differences due to legal form specific tax regimes, responding managers' personal characteristics play an important role. Both tax knowledge and the satisfaction with the current tax system in Germany are negatively associated with ATR and MTR misperception. In line with previous literature, we demonstrate that firms most frequently use the ATR instead of the appropriate MTR in their business decisions. However, in case of sole proprietorships and partnerships this inappropriate tax rate choice is often attenuated by tax rate misperception. Since firms tend to overestimate their (erroneously applied) ATRs, in around 40% of the cases, their estimated ATR is rather close to their actual MTR (deviations less than ±5pp). Hence, due to their ATR misperception they unintendedly apply the correct tax rate in decision-making. Together with the firms that apply their correctly estimated MTR, 51.5% of these firms use appropriate tax rates in their decisions.

Despite the importance and magnitude of tax rate misperception, other findings on entrepreneurial and corporate tax misperception are scarce to date. Literature focuses mostly

on individuals and finds a large extent of tax rate misperception. Schmölders (1960) pioneered this field and reports that about 50% of surveyed German individuals overestimate, 20% underestimate and roughly one third correctly estimates their average tax burden. Enrick (1963) notes that US taxpayers tend to underestimate their average tax burden. Van Wagstaff (1965) confirms these results in a survey on US employees and finds that about 10% hold accurate beliefs about their average tax burden. However, over- and underestimates are almost balanced. Auld (1979) surveys Canadian individuals and finds that low- and high-income respondents significantly overestimate their average tax burden, while members of the middle-income group estimate their ATR almost exactly. Gideon (2014), Gideon (2017), Ballard and Gupta (2018) observe in surveys that US individuals, on average, overestimate their ATR. Furthermore, Stantcheva (2021) finds that US individuals tend to misunderstand the progressivity level of the US tax system, i.e. perceive less progressivity than codified. Studies on individuals' ATR estimates for different income categories predominantly show a tendency towards overestimation of ATRs for low incomes and the contrary for higher incomes (Blaufus et al., 2015; Rees-Jones and Taubinsky, 2019). By contrast, Williamson (1976) finds respondents overestimating ATRs along all income categories. Relatedly, there are studies on individuals' beliefs about MTRs. Gensemer, Lean, and Neenan (1965) find in their survey on US high income earners that roughly 30% of the respondents are not aware of their MTR. A survey on Scottish managers and workers by Brown (1969) highlights that 80% of managers and workers do not accurately estimate their MTR, predominantly overestimating it. Rupert and Fischer (1995) find consistent evidence with less than 10% of their respondents estimating their MTR accurately. According to Fujii and Hawley (1988), only one third of their US respondents' estimates on MTRs are accurate. Also, Gideon (2017) provides evidence for US individuals with higher income underestimating their MTR. Blaufus et al. (2015) find that German individuals overestimate (underestimate) MTRs for given low (high) incomes. Further, they find that ATRs are often mistaken for MTRs. Consistently, Bartolome (1995) finds respondents to confuse ATRs and MTRs. All these studies focus on individuals in a non-business context only.

Even though decisions in firms are ultimately made by individuals, misperception in firms could be different from individuals for three reasons. First, managers in firms are exposed to and influenced by incentive structures (Armstrong, Blouin, and Larcker, 2012) which often are affected by taxes and therefore, to look precisely into taxes can be more important for a manager. Second, most firms should employ internal (tax department or tax-educated staff) and/or external tax knowledge (tax consultants) which, in turn, is likely to affect management decisions (DellaVigna, 2009; Feller and Schanz, 2017). Third, firms are subject to a firm-specific tax environment (tax code and tax framework) and are usually subject to more than one tax, which results in higher complexity of entrepreneurial taxation (see e.g., McKerchar, Ingraham, and Karlinsky, 2005). Having this in mind, a closer look on firms is necessary to understand the extent and drivers of firms' tax rate misperception.

Schmölders (1960) is the first to examine tax burden (mis)perception of entrepreneurs. His evidence indicates that the majority of surveyed farmers and self-employed individuals

overestimate their ATR. Although they have to pay income tax like employees, they are subject to a more pronounced misperception. Contrary, Blaufus et al. (2015) finds that self-employed and employed individuals are very similar in their tax (mis)perception. Unlike Schmölders (1960) and Blaufus et al. (2015), other studies on entrepreneurs' ATR (mis)perception, do not analyze self-employed and employed individuals separately. To the best of our knowledge, Hundsdoerfer and Sichtmann (2009) is the only study on entrepreneurial MTR (mis)perception. They investigate self-employed German physicians' perceptions of their MTR. About 25% of the respondents report MTRs that do not exist according to German tax law. For the remaining respondents over- or underestimations cannot be quantified since the authors do not determine actual MTRs to benchmark reported MTRs. Graham et al. (2017) provide survey evidence that tax executives in large firms often use the ATR or the statutory tax rate instead of the MTR in their decision-making process. Their results indicate that tax misperception occurs even in large firms with own tax departments. However, beyond this finding, Graham et al. (2017) do not analyze whether tax rates are correctly perceived.

We are the first to quantify firms' tax rate misperception, to identify drivers of tax rate misperception and to enhance findings on managers' tax rate choice for investment decisions by linking it to tax rate misperception. We employ an innovative survey-based measuring approach and exploit a sample of firms of different size, legal form and industry with a large share of SMEs. Therefore, this sample offers the rare opportunity to investigate these firms, that contribute a major share to the OECD economies but are widely underresearched. Additionally, we can fill the research gap between the numerous analyses of individuals' tax rate misperception and Graham et al. (2017) analysis of large corporation managers' tax rate misperception by examining mostly SMEs and private firms. By identifying and quantifying firms' tax rate misperception, we provide important insights that might enhance future studies on real effects of taxation. Quantifying tax rate misperception helps to predict firms' behavior in response to taxes and tax reforms more accurately. Further, quantifying the degree of misperception for different kinds of firms can help to develop proxies for tax rate misperception to be included in future empirical research on the evaluation of policy measures.

2.2 Survey Design & Sample

2.2.1 Survey Design

Our results are based on data collected from German firms via an online-questionnaire. The questionnaire incorporates different approaches to identify misperception and allows us to compare our results to the literature (e.g., Schmölders, 1960; Hundsdoerfer and Sichtmann, 2009; Blaufus et al., 2015; Graham et al., 2017). We conducted the survey using the online application LimeSurvey[1] in the period between Jan 11, 2021 and April 22, 2021. To obtain a rich sample, we approached firms with the help of various multipliers such as chambers

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[1] For more information, see `https://www.limesurvey.org/de` (08-19-2022).

of handicraft, manufacturing and trade or financial institutions as well as consulting firms.[2] We approached firms[3] either directly by e-mail or via our multipliers, which sent out e-mails, or employed their newsletter or website to contact the firms. We sent out a reminder where possible. As we distributed our questionnaire partially via multipliers, we are not able to determine an overall response rate.

As part of the process of developing the questionnaire, we gathered feedback upfront from several of our multipliers. In addition, we conducted pre-tests with selected multipliers, tax practitioners and students with prior knowledge in the field of business taxation. We use filter questions at various points to ensure that in particular small and craft firms only receive those questions that are relevant for them. The same holds for questions specific to the legal form. The final questionnaire consists of seven sections.[4] (1) We ask for firm characteristics such as legal form, number of employees, turnover, etc. (2) For the "tax burden block", we present a figure that illustrates the legal form-specific taxation of firms. Here, for sole proprietorships and partnerships, we illustrate the taxation with trade tax and transparent income tax, and for incorporated firms, the two-level taxation with corporate and trade tax at the corporate level and income tax at the shareholder level. Against this background, we ask the respondents to estimate their firm's ATR and MTR for a profit which we customized for each respondent based on relevant information about the respective firm. We asked respondents from corporations to estimate the ATR and MTR in two different settings, full retention of profits and full distribution to domestic shareholders (natural person). For sole proprietors and partnerships such a differentiation is dispensable as their taxation does not dependent on their distribution strategy.[5] (3) We asked for firms' tax rate relative to peers. (4) We asked the firms about whether and how they consider taxes and specific tax rates in their business decisions. (5) We asked respondents about the relative share of tax compliance costs in their firm's total compliance costs. (6) The respondents had to answer questions about the complexity of the tax system, the provision of tax-relevant information by tax authorities and trust in the expenditure policy of the government. (7) We asked them about whether their firm is, has been or is expected to be in a profit or loss situation and some personal characteristics of the respondent.[6]

Our research design involves some limitations: It cannot be ruled out that the results are influenced by a self-selection bias and that respondents answered not all questions seriously. As the median (mean) response time of around 14.2 (18.4) minutes is close to our estimate of

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[2]   A list of participating institutions can be found in our Executive Summary, see Fochmann et al. (2021).

[3]   We are aware of the fact that individuals respond to the survey on behalf of the firm. But for convenience and better readability, we refer to the firm as survey respondent if not otherwise stated.

[4]   Depending on firm characteristics and response behavior, the number of questions to be answered may vary. See Appendix B.1 for details about the survey.

[5]   Sec. 34a German Income Tax Code constitutes an exemption of this rule. However, due to its complexity this tax option is almost never exercised.

[6]   There are several reasons why we split the demographics into two parts, one in the beginning, one in the end: First, we need some firm characteristics for the determination of a firm's profit. Therefore, we ask for these characteristics upfront. Second, there are easy to answer questions, which allow for a convenient start in the questionnaire (Porst, 2014). But to not bore respondents with demographics, we ask for the second part in the end our survey. Furthermore, some easy to answer demographic questions are placed at the end to account for our relatively long survey (Häder, 2015).

15 minutes, this suggests that the questionnaire was taken seriously. Also, since the survey grants full anonymity, we expect honest answers. As we used neutral language framing effects were limited to a minimum. We supplemented terms that might have been unclear with explanations or visualizations to avoid deviating interpretations by respondents. All this and a battery of robustness tests makes us confident that our data is of high quality.

2.2.2 Sample

The total sample comprises 1,806 observations, of which 657 are complete.[7] We exclude 138 firms with characteristics that make them subject to a special tax treatment that is beyond the scope of our survey. We exclude for several reasons: (1) Firms are member of a group or fiscal unity, (2) Partnerships apply for a tax option according to Section 34a German Income Tax Code, (3) Firms state to be partly exempted from trade tax, (4) Firms with very low profits under €20,000[8], (5) Firms do state their ATR but not their MTR within the survey, or (6) firms cannot be matched within our propensity score matching (see Section 2.3.2).

This leaves us with a final sample of 519 German firms. 52% of these firms are sole proprietorships, 22.5% are partnerships (including mixed forms[9]) and 25.4% are corporations. More than 94.8% of the surveyed firms can be defined as SMEs (less than or equal to 250 employees and sales of less than or equal to €40,000,000).[10] Firms from the craft sector are particularly well represented (84% of our sample). The high weight of SMEs reflects the firm landscape of Germany and other big economies around the world: Examining for example the United States, Canada, United Kingdom and Germany shows that SMEs are by far the biggest group of businesses (OECD, 2022). Further, SMEs are responsible for more than 50% of the gross domestic product in most OECD countries (International Labour Organization, 2019). While SMEs and especially craft enterprises are an important factor to countries' economy, but hardly covered in previous literature, our sample allows us to study this highly relevant sector.

In Table 2.1 we compare our sample with the official German Business Register 2020 (German Federal Statistical Office, 2020).

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[7] For insights into the results of all observations, see our Executive Summary in Fochmann et al. (2021).

[8] We exclude firms with extremely low profits since we assume that this is only auxiliary income and therefore their actual income is not reliably predictable.

[9] Mixed forms are a special legal form that combine characteristics of partnerships and corporations such as GmbH & Co. KG.

[10] This is in accordance with Section 267 of the German Commercial Code (HGB).

TABLE 2.1: Summary Statistics of Survey Sample

	Sample N = 519	Business Register 2020 N = 3,374,583
Legal Form		
Sole Proprietorship	52%	63.0%
Partnership	22.5%	12.8%
Corporation	25.4%	24.2%
Employees		
0-9	63.2%	86.9%
10-49	25.4%	10.5%
50-249	5.8%	2.2%
250 and more	5.6%	0.5%

Notes: This table compares firm characteristics of our sample with the official German Business Register 2020.

Over 85.3% of our firms report a profit in 2020. Around 89.4% of the firms make use of the services of an external tax consultancy and 4.4% have their own tax department. Of our respondents, 78.8% are male, 19.1% female and 0.2% diverse; 97.2% hold an executive position, 77.1% claim to have tax knowledge. 51.5% of them acquired their tax knowledge through training or studies and 48.5% qualify as self-taught. In Table 2.2 we provide a summary statistics of our sample.

TABLE 2.2: Summary Statistics of Sample

Statistic	N	Mean	St. Dev.	Min	Median	Max
Profit	519	3,639,718.000	29,387,052.000	20,500	75,000	369,000,000
Employees	519	607.181	7,107.894	1	6	150,000
Corporation	519	0.254	0.436	0	0	1
Sole Proprietorship	519	0.520	0.500	0	1	1
Partnership	519	0.225	0.418	0	0	1
Profit in 2020	497	0.853	0.354	0	1	1
Tax Advisor	519	0.894	0.308	0	1	1
Tax Department	519	0.044	0.206	0	0	1
Male	519	0.788	0.409	0	1	1
Female	519	0.191	0.393	0	0	1
Manager	506	0.972	0.164	0	1	1
Tax Knowledge	519	0.771	0.421	0	1	1
Tax Complexity	510	4.643	0.699	1	5	5
Trust in Government	514	1.823	0.927	1	2	5
Tax Compliance Costs	514	0.332	0.209	0.000	0.300	1.000

Notes: This table presents summary statistics of our sample. Variable definitions and a more detailed version of this summary statistics can be found in Appendix B.2.

2.3   Measuring Tax Rate Misperception

We quantify firms' ATR and MTR misperception by contrasting the *reported tax rate* extracted from our survey with the *actual tax rate* determined by us. The difference between these two tax rates denotes the extent of firms' ATR/MTR misperception:

$$ATR\ Misperception = Reported\ ATR - Actual\ ATR \qquad (2.1)$$

$$MTR\ Misperception = Reported\ MTR - Actual\ MTR \qquad (2.2)$$

Even though we rely on German tax rules (given our sample consists of German firms), we are confident that our results are applicable for other countries since Germany's tax law is based on the internationally widely used dual system of business taxation shown in Figure 2.1 (Endres and Spengel, 2015). Sole proprietorships and partnerships (defined as non-legal entity in Germany) are subject to the so-called pass-through principle, where as corporations are subject to the separate entity principle.

FIGURE 2.1: Dual System of Business Taxation

Dual system of business taxation
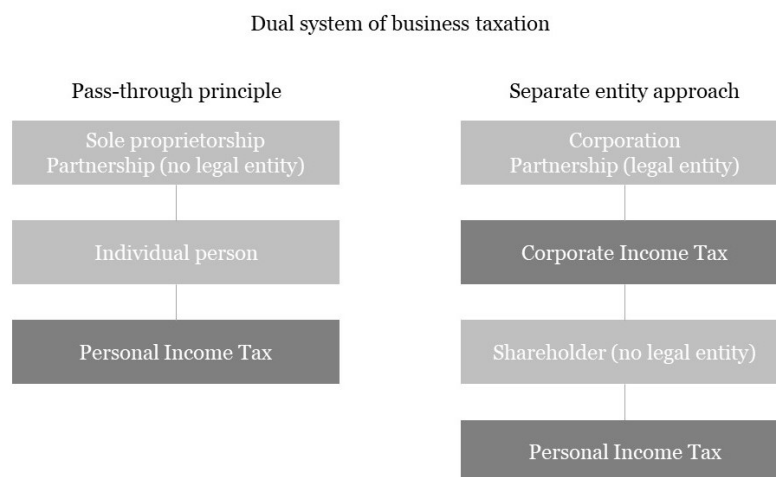
Notes: This figure illustrates the dual system of business taxation following Endres and Spengel (2015).

2.3.1 Reported Tax Rate

The variable *reported tax rate* describes each firm's answer when asked about its ATR and MTR. Since data on firms' profit is highly sensitive, in close consultation with our multipliers, we refrained from asking about their profit directly to avoid high dropout rates. Instead we asked for firm characteristics that enable us to be able to determine a profit that mimics the actual profit of each firm in the survey. Accordingly, firms are asked to estimate their ATR for this *given profit*. Our calculation of the *given profit* is based on aggregated annual financial statement data from the *Deutsche Bundesbank*,[11] which contains average profits per employee at industry-level for different firm sizes and legal forms. The *given profits* in the survey correspond to the median profits of firms in the same industry, with the same legal

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[11] We would like to thank the Research Data and Service Center, in particular Prof. Dr. Stefan Bender, for providing the data.

form and the same number of employees. To determine the MTR, firms are asked to estimate the tax rate on a 10% increase of the *given profit*.[12] Beyond avoiding overly high dropout rates, using median profits of comparable firms helps us to rule out effects of highly volatile firm profits. We assume less misperception when it comes to estimating the tax burden of a *normal* profit rather than the specific profit of a given year, which may differ considerably from the average performance. Relatedly, we use the latest available *Deutsche Bundesbank* data from 2018 and we refrained from extrapolating it to avoid inferences from the Corona Crisis.

2.3.2 Actual Tax Rate

Determining the *actual tax rate* as a benchmark is challenging as most data bases do not cover large parts of our sample firms. The most favorable option would be to apply the 'gold standard approach' (Gideon, 2014, p. 1) and to compare *reported tax rates* with tax rates derived from tax return data. However, German tax return data of firms (as well as of individuals) is not accessible at the micro level due to data protection regulations. Given the structure of our sample (predominantly SMEs, many sole proprietorships and partnerships), we also cannot employ tax information provided in financial statements because the respective data is missing due to limited disclosure obligations of these firms. But we cannot exploit financial statement tax information of (larger) corporations either, since most of them did not agree on matching their financial statement and survey data.

Hence, we have to determine firms' tax rates based on an own approach which is explained in the next two sections of this paper. Because of the differences in tax regulations applicable to sole proprietors and partnerships on the one and corporations on the other side we develop two separate approaches to determine *actual tax rates*.

2.3.2.1 Sole Proprietorships & Partnerships

Determining *actual tax rates* of sole proprietorships and partnerships is not straightforward due to legal form-specific tax rules in Germany. As mentioned, sole proprietorships and partnerships are subject to the so-called pass-through principle, i.e. firms' profits are attributed to firm owners and taxed according to their individual income tax rate. Firm owners' profits are included as business income (Section 15 German Income Tax Code) in their taxable income which is subject to a progressive income tax schedule[13] (incl. solidarity surcharge[14]). Since the taxable income does not only include business income but also other

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[12] In addition to indicating the 10%, we also specify the increase in €(10% of the *given profit*) to avoid any confusion with the percentage figure only.

[13] The income tax follows a progressive tax schedule with marginal tax rates from 0% to 45% acc. to Section 32a German Income Tax Code.

[14] The solidarity surcharge is added on the income tax and amounts to 5.5% acc. to Section 4 Solidarity Surcharge Code. In 2021 the law changed and the solidarity surcharge omits for roughly 90% of the taxpayers, see `https://www.bundesfinanzministerium.de/Content/DE/FAQ/2019-08-21-faq-solidaritaetszuschlag.html` (08-19-2022). Since we asked for profits in 2020 and this novel ruling might not be known by our respondents, we include it in our calculation to avoid creating artificial tax rate overestimation.

categories of (additional) income (e.g., income from employment or rental income) and *Special Expenses* (e.g., social security contributions) can be deducted, we must take these tax base effects into account when calculating actual income tax rate.

To account for these tax base effects, it is necessary to incorporate *Additional Income* and *Special Expenses* when determining the actual ATR and MTR.[15]

$$Taxable\ Income_i = Profit_i + Additional\ Income_i - Special\ Expenses_i \qquad (2.3)$$

Here, *Profit* is the *given profit* in the survey. For partnerships, we divide the partnership's profit by the number of partners due to lack of information on a partnership's profit distribution agreement. We did not ask for *Additional Income* and *Special Expense* within the survey due to its sensitive nature. Further, the responding person is often an employed manager who does not these private data of firm owners. But even, responding firm owners might have difficulties estimating their tax related *Additional Income* and *Special Expenses* accurately. Thus, we use the "Factually Anonymized Data from Income Tax Statistics" (FAST 2014) offered by the German Federal Statistical Office to impute *Additional Income* and *Special Expenses* into our survey data. FAST 2014 is a 10% stratified sample of the Official Income Tax Statistics of 2014 which contains extensive tax information on German taxpayers (e.g., sources of income, *Special Expenses*, tax liability). However, data protection regulations prevent us from matching single taxpayers to the corresponding firm owners of our sample firms. Therefore, we match each of our firms with a predefined number of FAST 2014 observations that are as similar as possible based on the following characteristics: profit, industry, and legal form. We impute the median value of *Additional Income* and *Special Expenses* of the respective FAST 2014 observations into our data. Figure 2.2 illustrates how we derive the *Taxable Income* based on a *Profit* reported for a sole proprietorship or partnership.

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[15] Even though we provide a lot of guidance to the firms to make sure that they focus on business income, we have no guarantee that they do not incorporate *Additional Income* and *Special Expenses* when estimating their tax rate. To show the robustness of our results, we conduct a robustness check by running our analysis based on profits only; see Appendix B.5.

FIGURE 2.2: Approach to determine Taxable Income
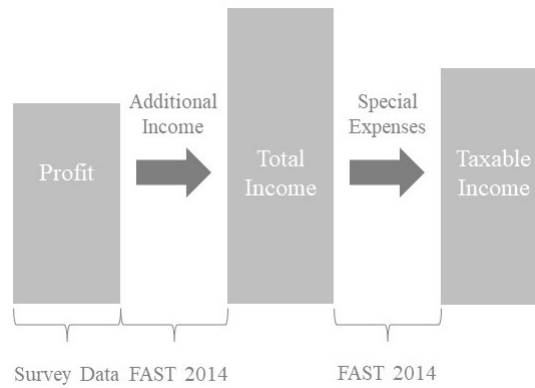
Notes: This figure illustrates the determination of the Taxable Income based on the *given profit* from our survey, *Additional Income* (FAST 2014) and *Special Expenses* (FAST 2014). This stylized illustration only sketches the process of determining the *Taxable Income*, it is not supposed and does not reflect the actual size of *Additional Income* and *Special Expenses*. It is important to note that *Additional Income* can be negative.

To match survey and FAST 2014 observations we use a Propensity Score Matching approach.[16] Our propensity scores (Rosenbaum and Rubin, 1983) are based on the following simple logistic regression equation:

$$Survey_i = \alpha_i + \beta_i \cdot X_i + \epsilon_i \tag{2.4}$$

where *Survey* is 1 if it is a survey observation and 0 otherwise and *X* is the set of our of matching variables. *X* includes *Profit*, *Industry*, and *Legal Form*. *Profit* is the natural logarithm of firms' profit,[17] *Industry* describes in which industry the firm operates in, *Legal Form* describes if a firm is a sole proprietorship or a partnership. To determine tax rates, it is also relevant whether a firm owner files his or her tax return alone or jointly with a spouse (income tax splitting). Since we could not ask for the marital status of firm owners due to data protection regulation, we match our survey observation twice - once with single FAST 2014 taxpayers and once with FAST 2014 joint taxpayers. For this purpose, we include a variable *Marital Status* which is 0 in case of a single and 1 in case of a married person. We use nearest neighbor matching within a 0.1 caliper radius without replacement.[18] Since we rely on a 1:10 propensity score matching, we find the ten closest comparable taxpayers within the FAST 2014 data based on the propensity score. A successful propensity score matching relies on the assumption that the remaining variables have no influence on the depending variable (Bilicka, 2019; Shipman, Swanquist, and Whited, 2017; Stuart, 2010). Although, we

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[16] See Appendix B.3 for results of the Propensity Score Matching.

[17] Since FAST 2014 includes nominal 2014 values, but the *given profit* in the survey is based on 2018 values, we deflate the *given profit* by GDP growth in Germany between 2014 and 2018 to obtain comparable values.

[18] See Cochran and Rubin (1973) and Rosenbaum and Rubin (1985) for the determination of the optimal caliper. We define the caliper with 0.1 as small as possible to get a precise matching but large enough that we can get the 10 matches in the vast majority of cases. Nevertheless, we run robustness checks with a caliper of 0.2 on a 1:10 matching and a caliper of 0.2 on a 1:20 matching. The results are robust; there are only marginal differences in the amount of misestimating firms (<= ±0.5pp)

cannot empirically test this assumption due to (survey) data limitations, we follow Ship-
man, Swanquist, and Whited (2017) and carefully select the most influential variables on tax
rates of sole proprietors and partners based on theoretical considerations. We account for
those characteristics (*Profit*, *Industry*, *Legal Form*, and *Marital Status*) that affect the *actual tax
rate* of a non-corporation.[19]

Table 2.3 provides an overview of the effect of our imputation on the *Taxable Income*. The
difference between ③ *Taxable Income* and a firm's ① *Profit* depends on the marital status and
the legal form. For our following analyses we rely on the taxable income to determine the
actual tax rate.

TABLE 2.3: Profit and Taxable Income

		Sole Proprietorships		Partnerships	
		Single	Married	Single	Married
①	Profit	100.0%	100.0%	100.0%	100.0%
	+ Additional Income	1.8pp	30.7pp	3.8pp	39.5pp
②	Total Income	101.8%	130.7%	103.8%	139.5%
	− Special Expenses	-16.3pp	-23.8pp	-8.2pp	-16.5pp
③	Taxable Income	85.5%	106.9%	95.7%	123%

Notes: This table shows mean imputed values of *Additional Income* and *Special Expenses* relative to Profit by the four identified
groups. Profit is the *given profit* in our survey that is attributed evenly among the number of partners.

In the Appendix B.5, we show robustness of our results for using profits or total income to
compute the *actual tax rate*.

After determining a firm's *Taxable Income*[20], we rely on the German Income Tax Schedule to
determine the *actual tax rate*.

In addition to the personal income tax (PIT), profits of (commercial) sole proprietorships and
partnerships are subject to trade tax (TT), which is determined based on the firm's profit.
Determining the actual trade tax rate is straightforward by multiplying the trade tax multi-
plier reported by the firm by the base trade tax of 3.5%.[21] However, the TT is entirely or at

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[19] In Germany firms can use a tax loss carrybackward or carryforward, which can influence the tax rate as
well. Within our survey we cannot define if and to what extent survey respondents included it in their
reported ATR. To rule out that we miss a potentially relevant factor, we compare reported ATRs of firms that
reported a loss for 2019 or 2020 with comparable firms that had profits in 2019 and 2020. The results show no
significant difference in their reported ATR, which is why we are confident neglecting losses does not affect
our results.

[20] For high incomes exceeding €972,411, our matching process is not applicable since FAST 2014 does not
include such high income earners due to data protection regulations. Nevertheless, we keep these observa-
tions in our sample, but do not add *Additional Income* and *Special Expenses*. Since such profits already exceed
the threshold at which tax progression has a noticeable effect on ATRs (and no effect on MTR), this approach
does not bias our results.

[21] In Germany, the local trade tax multiplier is set by each municipality separately, which is why we ask firms
for this variable. If there is no or no plausible entry on the trade tax multiplier we use 400%. This figure
represents the weighted average of the trade tax multiplier in Germany - as used by the OECD Tax Statistics,
OECD (2022).

least largely compensated by an income tax credit (Section 35 German Income Tax Code) for which we also account for.

The following equations sum up our approach to determine the actual ATR and MTR:[22]

$$Actual\ ATR_i = PIT(Taxable\ Income_i) + TT_i(Profit_i) - Income\ Tax\ Credit(TT_i) \qquad (2.5)$$

$$Actual\ MTR_i = PIT(\Delta\ Profit_i) + TT_i(\Delta\ Profit_i) - Income\ Tax\ Credit(\Delta\ TT_i) \qquad (2.6)$$

Due to the entire or vast neutralization of the TT by the income tax credit both ATRs and MTRs of sole proprietorships and partnerships are almost entirely determined by the progressive income tax rate.

To account for effects emerging from differences in the marital status of firm owners we use a conservative approach. We compare the deviation of the *reported tax rate* from the *actual tax rate* for each marital status and then use the smaller deviation as our measure for tax misperception. With this approach we avoid identifying misperception that is solely based on a false categorization of a firm owner as a single/married person.

2.3.2.2 Corporations

Determining the *actual tax rate* of corporations is straightforward. We use the respective (flat) tax rates for corporate and shareholder taxation.[23] As shown above, corporations are taxed according to the separate entity principle: Profits are subject to corporate income tax (CIT incl. solidarity surcharge = 15.825%) and TT (depending on the trade tax multiplier of a municipality) at the firm level irrespective whether profits are retained or distributed.

In case of retained profits, we determine the *actual tax rate* as follows:

$$Actual\ ATR/MTR_{\text{retained,i}} = CIT + TT_i \qquad (2.7)$$

If profits are distributed to natural persons as shareholders, they are subject to the income tax of the shareholder which is generally the final withholding tax (WHT incl. solidarity surcharge = 26.375%).

In case of distributed profits, we obtain the *actual tax rate* as follows:

$$Actual\ ATR/MTR_{\text{distributed,i}} = CIT + TT_i + [1 - (CIT + TT_i)] \cdot WHT \qquad (2.8)$$

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[22] For the actual MTR, we use the profit and increase it by 10%. This way we ensure that there is just an increase in profit, but no change in *Additional Income* and *Special Expenses*, which are unrelated to an increase in business income.

[23] In some cases, dividends are subject to the regular progressive income tax schedule, but 40% of dividends are tax exempt in order to avoid excessive taxation of corporate profits. In these cases, too, the income tax rate is generally very close to the final withholding tax.

As corporations' retained and distributed profits are subject to a flat tax rate, the actual MTR does not deviate from the corresponding ATR. Thus, in contrast to sole proprietors and partnerships, the actual ATR and MTR are identical.

2.4 Results

2.4.1 Extent of Tax Rate Misperception

To answer 'Whether and to what extent do firms have tax rate misperception?', we provide descriptive evidence to what extent firms misperceive their ATR and MTR. First, we quantify misperception metrically. Besides analyzing overall misperception, we also examine over- and underestimation of ATR and MTR separately. Second, we identify the share of misperceiving firms by using our metric measure of misperception. As we are interested in the share of misperceiving firms, we have to define when a *reported tax rate* is considered to be accurate or misperceived. We choose a conservative approach and accept deviations of the *reported tax rates* within a narrower corridor of ±5pp or a broader corridor of ±10pp from the actual ATR and MTR as accurate.[24] We display the sensitivity of misperception with respect to a corridor width from nearly 0pp to 50pp in Figure B.1 in Appendix B.4.

In Table 2.4, we show mean values of reported and actual ATRs and MTRs. The firm-specific benchmark tax rates are determined based on taxable income as described in Section 2.3.2.

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[24] Blaufus et al. (2015) also apply a corridor of ±5pp to classify *reported tax rates* as misperceived.

TABLE 2.4: ATR and MTR Misperception

	Sole Proprietorships N = 270	Partnerships N = 117	Corporations N = 132	
			retained	*distributed*
Reported ATR	32.7%	36.9%	31.4%	43.3%
Actual ATR	19.7%	30.9%	29.8%	48.3%
ATR Misperception Share >5pp (>10pp)	**13pp***** 71.1% (56.3%)	**6.1pp***** 73.5% (58.1%)	**1.6pp**** 43.2% (22%)	**-5pp***** 65.2% (43.9%)
ATR Overestimation Share >5pp (>10pp)	15.6pp 67.8% (54.8%)	12.7pp 57.3% (44.4%)	5.9pp 28% (13.6%)	8.7pp 19.7% (11.4%)
ATR Underestimation Share >5pp (>10pp)	-4.4pp 3.3% (1.5%)	-12.3pp 16.2% (13.7%)	-5.8pp 15.2% (8.3%)	-12.8pp 45.5% (32.6%)
Reported MTR	31.3%	36.6%	31.9%	43.3%
Actual MTR	34.1%	42.1%	29.8%	48.3%
MTR Misperception Share >5pp (>10pp)	**-2.8pp***** 57.8% (39.6%)	**-5.6pp***** 57.3% (37.6%)	**2.1pp**** 46.2% (29.5%)	**-5pp***** 64.4% (49.2%)
MTR Overestimation Share >5pp (>10pp)	9.6pp 23.7% (14.1%)	5.9pp 21.4% (9.4%)	8.2pp 31.1% (18.2%)	9.4pp 19.7% (14.4%)
MTR Underestimation Share >5pp (>10pp)	-13.3pp 34.1% (25.6%)	-16.5pp 35.9% (28.2%)	-7.5pp 15.2% (11.4%)	-14.4pp 44.7% (34.8%)

Notes: This table shows descriptive evidence of ATR and MTR Misperception. Reported ATR/MTR is the mean value of reported ATRs by legal form. Actual ATRs/MTRs are calculated benchmark ATRs. ATR/MTR Misperception is calculated as Reported ATR/MTR minus Actual ATR/MTR. ***, **, and * denote significance at the 1%, 5%, and 10% levels of a two-sided t-test (ATR/MTR Misperception = 0). ATR/MTR Overestimation measures the average ATR/MTR Misperception in case of positive deviations, and ATR/MTR Underestimation measures the average ATR/MTR Misperception in case of negative deviations. Share >5pp (>10pp) gives the share of all firms that misperceive, overestimate, or underestimate the Actual ATR/MTR by more than ±5pp (±10pp).

On average, sole proprietorships and partnerships significantly overestimate their ATR. Contrary, they tend to underestimate their MTR. Corporations, on average, only slightly overestimate their ATR on retained profits. Misperception rises considerably and turns into underestimation if corporations are asked about their perception of the ATR in case profits are fully distributed. Likewise, they overestimate their MTR at the firm level and underestimate it when including shareholder taxation. For ATRs and MTRs, the share of corporations misperceiving them is comparable although the level of misperception is considerably higher for distributed profits. To identify potential patterns of misperception induced by the legal form, in the subsequent sections we examine misperception of non-corporations and corporations separately.

2.4.1.1 Sole Proprietorships and Partnerships

We display reported ATRs of sole proprietorships and partnerships in Figure 2.3. The two dot-dashed lines show the actual ATRs determined on profits for married (lower line) and single (upper line) firm owners to illustrate the ATR trend.

FIGURE 2.3: Reported ATRs of Sole Proprietors and Partnerships
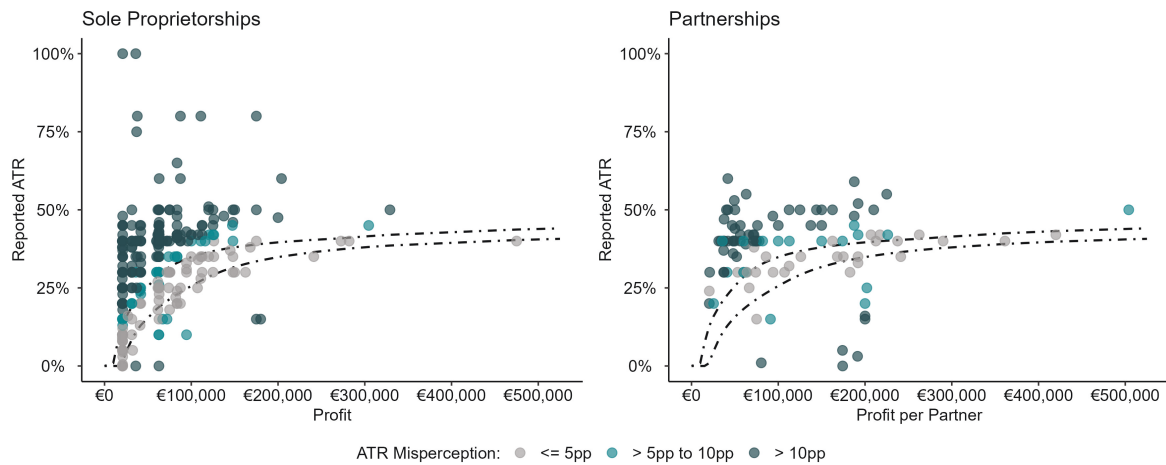
Notes: This figure shows reported ATRs of sole proprietors and partnerships. All points represent reported ATRs, the dashed lines illustrate ATRs on profits of married (lower line) and single (upper line) taxpayers in Germany. The level of misperception is indicated by the color of each point and misperception is identified based on ATRs of taxable income. For presentation reasons, the figure does not include observations for profits above €500,000.

Although reported ATRs somewhat reflect the progressive slope of the German income tax schedule, we find many overestimates, especially in the direct progressive zone of the tax schedule (taxable income below around €57,000). Within the 'deviation-corridor' of $\pm$5pp ($\pm$10pp) from the actual ATR 71.1% (56.3%) of sole proprietors misperceive their ATR, with 95.3% (97.4%) of them overestimating it. In case of partnerships 73.5% (58.1%) of the firms misperceive their ATR, with 77.9% (76.5%) of them overestimating it.

FIGURE 2.4: Reported MTRs of Sole Proprietorships and Partnerships
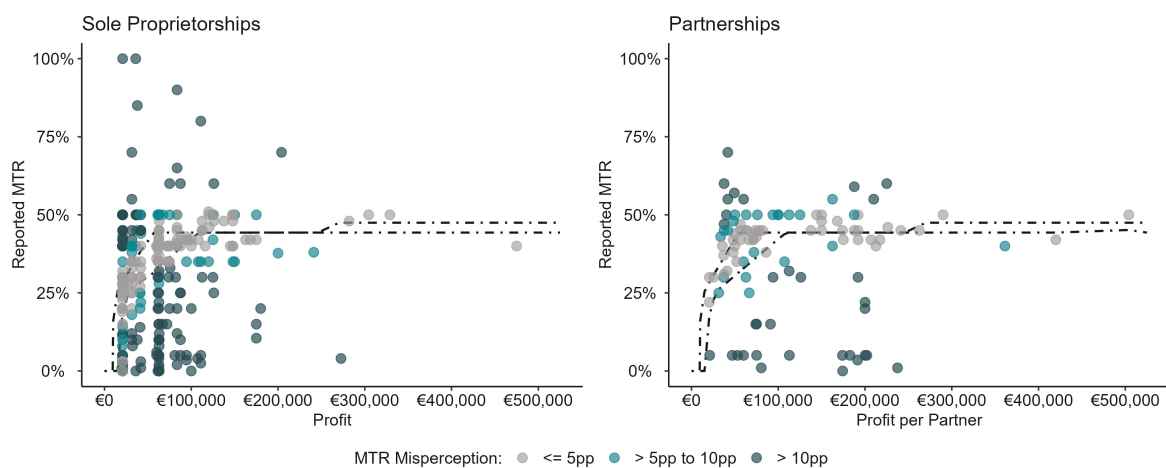
Notes: This figure shows reported MTRs of sole proprietors and partnerships. All points represent reported ATRs, the dashed lines illustrate ATRs on profits of married (lower line) and single (upper line) taxpayers in Germany. The level of misperception is indicated by the color of each point and misperception is identified based on ATRs of taxable income. For presentation reasons, the figure does not include observations for profits above €500,000.

Reported MTRs of sole proprietors and partnerships are displayed in Figure 2.4. When allowing for a deviation of ±5pp (±10pp) from the actual MTR, 57.8% (39.6%) of sole proprietors and 57.3% (37.6%) of partnerships misperceive their MTR. Underestimation is the prevalent pattern for sole proprietors (59% (64.5%)) as well as for partnerships (62.7% (75%)). Interestingly, sole proprietors and partnerships seem to be less exposed to misperception of MTRs than to misperception of ATRs. To examine that the effects of tax rate misperception on business decisions, we conduct additional tests in Section 2.4.3.

Our results document an overall pronounced tax rate misperception. To draw conclusions on firms' ability to understand the concept of ATR and MTR resulting from the progressive income tax schedule, we compare reported ATRs and MTRs. In a direct progressive tax system such as the German income tax, except for the range of the personal allowance, MTRs always exceed the corresponding ATRs. Thus, for sole proprietors and partnerships, we expect firms to consistently report MTR > ATR. In Figure 2.5, we plot average reported ATRs and MTRs of sole proprietorships and partnerships on *given profits*.

FIGURE 2.5: Reported ATR-MTR Relation of Sole Proprietorships and Partnerships
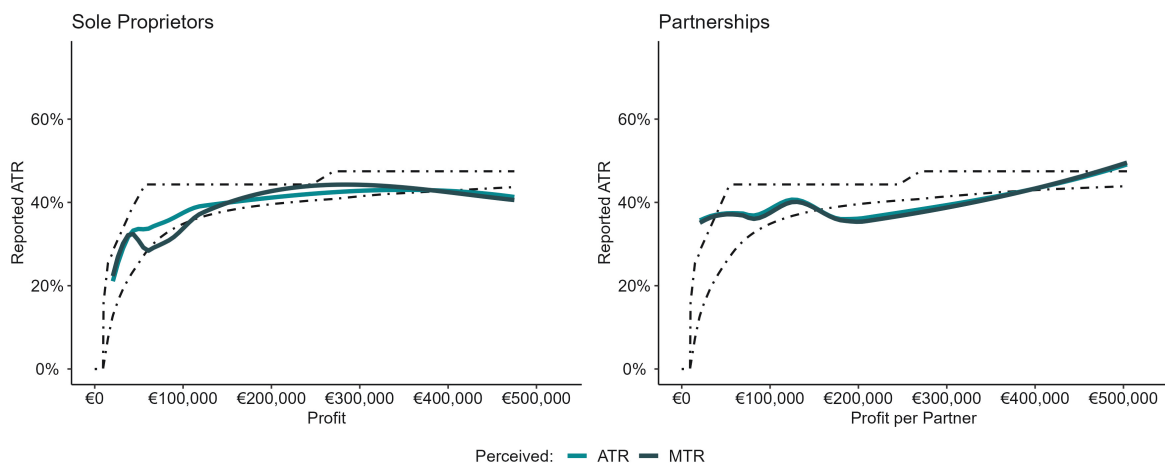
Notes: This figure shows mean reported ATRs and MTRs for sole proprietors and partnerships. The estimated mean lines are generated by locally estimated scatterplot smoothing. The dot-dashed lines are reference lines for the actual ATR (lower) and MTR (upper) for a single taxpayer. For presentations reasons, the figure does not include observations for profits above €500,000.

Interestingly, examining sole proprietors' and partnerships' average reported ATRs and MTRs across the income range reveals a trend different from our expectations: On average, reported MTRs are not or only hardly distinguishable from reported ATRs[25], even though sole proprietors report significant smaller MTRs than ATRs for profits ranging between €50,000 and €125,000. This is a remarkable misperception of the relation between ATR and MTR and indicates that our firms do not understand the German progressive income tax schedule. Further, we disclose an interesting pattern of misperception: More than

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[25]   Paired t-test with $p > 0.10$.

half of all sole proprietors and partnerships that misperceive their ATR also misperceive their MTR.[26]

We find merely less than 50% of report MTRs exceed corresponding ATRs. About 20% even report ATRs larger than MTRs. These firms seem to have difficulties in understanding the concept of MTR. Half of them provide single digit MTRs although they report double digit ATRs.[27] One third of sole proprietors and partnerships simplifies their estimation by using the same tax rate for ATR and MTR. This could be regarded as a support of Rees-Jones and Taubinsky (2019) who show that individuals tend to linearize the tax schedule based on their ATR (*ironing heuristic*). However, we are skeptical whether these firms really base their tax rate estimates on their ATR for two reasons: First, these firms are much better in estimating their MTR than their ATR.[28] Second, more than 15% of these firms report an ATR of 42% resp. 45% which are the two MTRs explicitly listed in Section 32a of the German Income Tax Code and often mentioned in political debates.[29] Hence, we argue that at least this fraction of sole proprietors and partnerships anchor their ATR estimates on the more salient MTRs.

2.4.1.2 Corporations

The taxation of profits at the corporate level is independent of the personal circumstances of the shareholders, in accordance with the *separation principle*. The reported ATR in Figure 2.6 is divided into (1) retained profits of the corporation and (2) distributed profits including taxation at the shareholder level. The dot-dashed line indicates the nominal tax rate of 29.825% as a reference line for the *actual tax rate* on retained profits.[30] In case of distributed profits, the reference line also includes dividend taxation with the final withholding tax of 26.375% (25% + 5.5% of it solidarity surcharge) (Section 32d (1) German Income Tax Code).

For retained profits, many firms report a tax rate close to the reference line. Nevertheless, there is considerable variation especially within the lower profit area. When allowing for a deviation of ± 5pp (± 10pp) from the actual ATR, 43.2% (22%) of corporations misperceive their ATR on retained profits, with 64.9% (62.1%) of them overestimating it. These values are surprisingly high given the flat and easy to determine tax rate on retained profits. The share of misperception substantially increases for distributed profits as in Figure 2.6 depicts. 65.2% (43.9%) of corporations misperceive their ATR on distributed profits given a corridor of accepted deviation of ± 5pp (± 10pp) from the actual ATR, with only 30.2% (25.9%) of them still overestimating the tax burden.

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[26] Based on a deviation of ± 5pp from the actual ATR/MTR.

[27] It may be that these firms did not understand the question about the marginal tax rate. We perform additional analyses for subsamples excluding these firms, see Appendix B.5.

[28] The average ATR Misperception is 9.6% and the average MTR Misperception is -2.9%.

[29] In this regard, Bartolome (1995) demonstrate that tax rates that are more salient in a tax table presented to respondents are used more often in economic decisions.

[30] Despite the flat tax rate, the *actual tax rate* can vary between corporation due to different local trade tax multiplier. To simplify the figure, we use the mean value of 400% which results in a tax rate of 29.825% (= 15% * (1 + 5.5%) + 400% * 3.5%).

FIGURE 2.6: Reported ATRs of Corporations
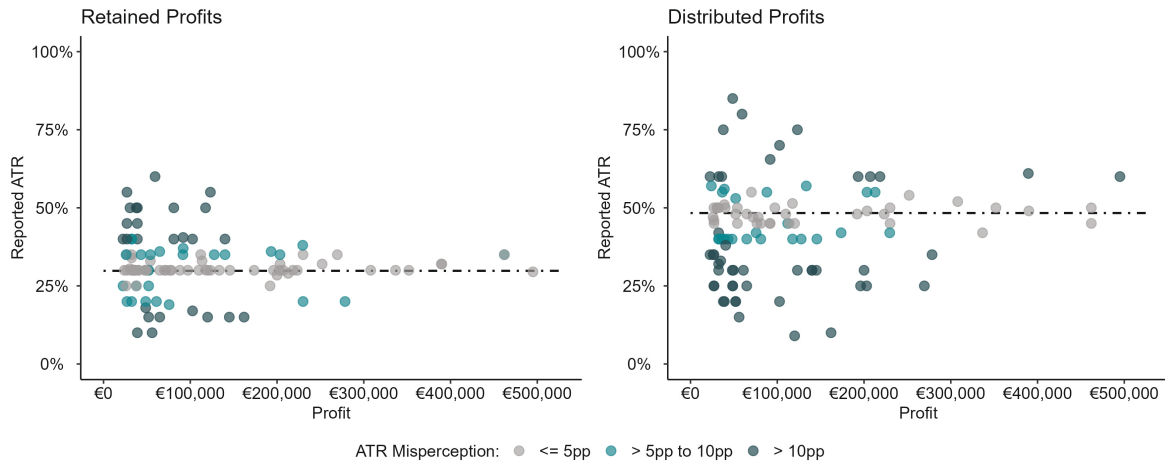
Notes: This figure shows ATR Misperception of corporations in case of retained and distributed profits. All points represent reported ATRs, the dashed line indicates the respective corporate tax rate at a trade tax multiplier of 400%. The level of misperception is indicated by the color of each point. For presentation reasons, the figure does not include further observations for profits above €500,000.

Comparing the reported ATRs on retained and distributed profits allows us to deduce the misperception of dividend taxes. In contrast to the findings on retained profits, taxation of dividends, is also on average, significantly misperceived. This is surprising as dividends are regularly taxed at a flat tax rate of 26.375% (25% final withholding tax plus solidarity surcharge) whereas our corporations indicate an average dividend tax rate of 16.958%. Evidently, corporations are relatively accurate at estimating their ATR at the corporate level, but have considerably less understanding of the ATR on distributed profits.

We provide reported MTRs of corporations for retained and distributed profits in Figure 2.7. There, the reference line shows the actual MTR for full profit retention and distribution, resp., both for a trade tax multiplier of 400% and equals the reference lines. If misperception is defined as a deviation of more than ±5pp (±10pp) from the actual MTR, 46.2% (29.5%) of corporations misperceive their MTR on retained profits, with 67.2% (61.5%) overestimating it. For distributed profits, 64.4% (49.2%) of the corporations misperceive their MTR if misperception is defined as a deviation of more than ±5pp (±10pp) from the actual MTR. The share of overestimating firms amounts here only to 30.6% (29.2%). Given the tolerance range of ±5pp, 94.7% (96.5%) of ATR misperceiving corporations also inaccurately report their MTR for retained (distributed) profits.

FIGURE 2.7: Reported MTRs of Corporations

Notes: This figure shows ATR Misperception of corporations in case of retained and distributed profits. All points represent reported ATRs, the dashed line indicates the respective corporate tax rate at a trade tax multiplier of 400%. The level of misperception is indicated by the color of each point. For presentation reasons, the figure does not include observations for profits above €500,000.

In comparison to the findings on ATR misperception, corporations are less accurate in estimating their MTR, especially for retained profits, as the variation in MTRs is significantly higher than in ATRs. This result is interesting as retained profits are used for investment and MTRs should be used for the resp. decisions. So, in Section 2.4.3 we investigate the role of misperception for business decisions.

FIGURE 2.8: Reported ATR-MTR Relation of Corporations

Notes: This figure shows mean reported ATRs and MTRs for corporations in case of retained and distributed profits. The estimated mean lines are generated by locally estimated scatterplot smoothing. The dot-dashed line represents the average actual ATR and MTR. For presentations reasons, the figure does not include observations for profits above €500,000.
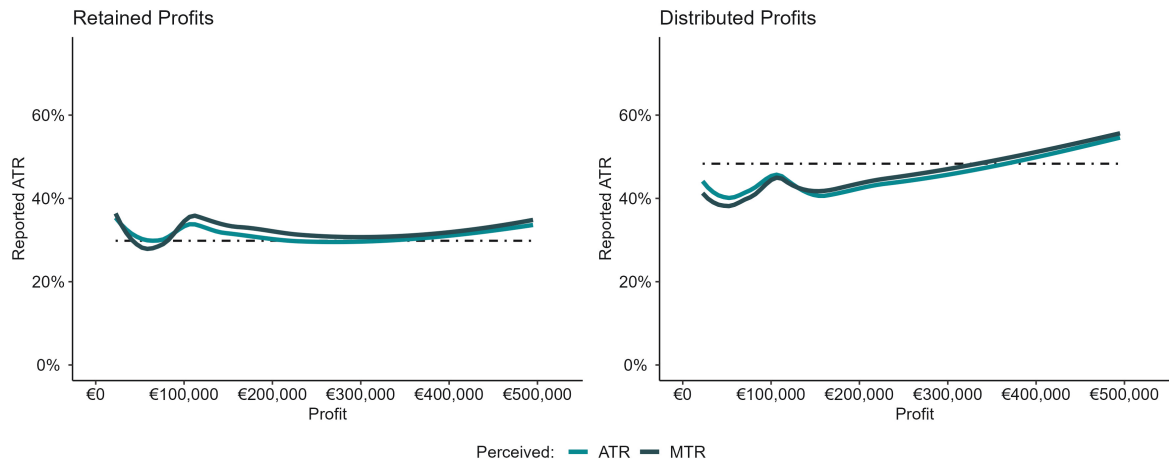
Our results document that corporations, on average and in line with our expectations, report very similar ATRs and MTRs. An illustration of the relation of ATR and MTR for corporations is provided in Figure 2.8. Nevertheless, we still find that 25% (37.1% report MTRs different to ATRs in case of retained (distributed) profits. Although distributing profits does

not change the proportionality of the tax schedule, more corporations are unable to estimate the relation between ATR and MTR correctly.

2.4.2 Drivers of Tax Rate Misperception

After showing that firms often misperceive their ATR and MTR, we analyze which drivers affect firms' tax rate misperception. The independent variables to be included in our model are based on the extensive research on individuals' tax misperception (see Blaufus et al., 2022) and on special characteristics of our firms. We analyze the potential drivers using our survey data and conducting a regression analysis of the following simplified form:

$$Misperception_i = \alpha + \beta \cdot Drivers_i + \epsilon_i \qquad (2.9)$$

We define misperception as the absolute value (in pp) of either ATR misperception or MTR misperception for two reasons. First, we are only interested what drives misperception regardless of the kind of misperception. With this approach, we also abstract from over- and underestimates, and the coefficients can be interpreted more easily. Second, we separately investigate heterogeneity in over- and underestimations.

We cluster drivers in the following two categories:

Firm Characteristics. We analyze four firm characteristics. (1) *Employees:* The number of employees allows us to proxy a firm's size. As shown in Graham et al. (2017), larger firms often employ qualified tax personnel due to facing more tax-related duties and responsibilities (e.g., fulfilling compliance requirements or tax planning opportunities). Following this argumentation, size should decrease tax rate misperception. In addition, the tax schedule for non-corporations involves size-related calculation difficulties: Firms with lower profits are subject to the direct progressive part of the German income tax schedule, making it more difficult to determine both ATRs and MTRs than for firms with higher profits, which are subject to the proportional marginal tax rate of 42% or 45%. For this reason, the size-effect is likely to be stronger for non-corporations. (2) *Corporation:* While non-corporations are taxed according to the direct progressive German income tax schedule and there is a complex interaction between trade and income tax, retained profits of corporations underlie a flat tax rate without any interdependence between corporate and trade tax. Therefore, the legal form represents a proxy for the degree of tax code complexity (Hoppe et al., 2021). Given the more complex taxation of non-corporations and insights of the literature that more complexity translates into more tax-related misperception (e.g., Bratten et al., 2017; Sielaff and Wolf, 2016), being a corporation should decrease tax rate misperception in case of retained profits. If profits are distributed, the interaction between corporate and shareholder taxation leads to an increase of complexity and an expected increase in tax rate misperception of corporations. (3) *Loss:* Firms that have incurred losses in previous years might have tax loss carryforwards that reduce their current tax rate. Additionally, *Loss* might have a rather indirect effect on the accuracy of tax rate estimates as losses increase tax complexity due to loss-offset regulations and likewise tax uncertainty of the firm. Fochmann, Kiesewetter,

and Sadrieh (2012a) show in a lab experiment that respondents have a biased perception of loss-offset regulations. Hence, we expect that *Loss* is positively associated with tax rate misperception. (4) *Tax Assistance:* From the literature on individuals (Ballard and Gupta, 2018; Gideon, 2014; Rupert and Fischer, 1995) it is known that using *Tax Assistance* of a tax adviser in the tax preparation process, leads to more misperception since tax knowledge is outsourced. We assume a similar pattern for firms and predict a positive relation between firms using (external) *Tax Assistance* and tax rate misperception.

Personal Characteristics. We analyze four personal characteristics of the responding firm representative. (5) *Tax Knowledge Index:* Findings from the literature on tax knowledge are mixed: Graham et al. (2017) report a positive effect of managers' tax knowledge on the appropriate consideration of taxes in business decisions, whereas Slemrod (2006) finds no effect of tax knowledge on individuals' misperception of tax schedule progressivity. Therefore, the effect of tax knowledge on tax rate misperception is unclear. Following Stantcheva (2021), we build a comprehensive *Tax Knowledge Index* that increases with showing a better understanding of basic tax concepts. It comprises Tax Knowledge, Tax Schedule, Tax Rate Choice, and Business Decisions. Tax Knowledge is the self-reported tax knowledge (0/1); Tax Schedule is for non-corporations 1 if ATR < MTR, otherwise 0 and for corporations 1 if MTR = ATR, otherwise 0; Tax Rate Choice is 1 when using the MTR in business decisions, otherwise 0; and Business Decisions is the frequency of incorporating taxes in business decisions (1,5). We include these variables as Z-scores. We achieve the transformation into Z-scores by subtracting the group mean from each observation and then dividing this figure by the group standard deviation; leading for each Z-score having a mean of 0 and standard deviation of 1 (see Appendix B.2.). The *Tax Knowledge Index* is standardized as well (Z-score). (6) *Tax Satisfaction:* The utility function of a firm manager may also include satisfaction considerations which might affect their tax rate estimates.[31] We construct a *Tax Satisfaction Index* that increases when firms are more satisfied with the current tax system in Germany. It comprises the following indicator variables: Tax Cut, Tax Complexity, Trust in Government, Tax Compliance Costs, and Peers' Tax Burden. Tax Cut is the difference between reported ATR and an ATR that firms regard as fair (-1,1); Tax Complexity is the perceived level of tax complexity (1,5); Trust in Government is the level of trust in public spending (1,5); Tax Compliance Costs are the reported tax compliance costs relative to the total compliance costs (0,1); and Peer's Tax Burden indicates how firms rate their own tax burden compared to the tax burden of competitors (0,1). Again, we include these variables as Z-scores. *Tax Satisfaction Index* is standardized as well (Z-score). (7) *Female:* Building on the existing literature on individuals, there is mixed evidence: Females tend to overestimate their ATR (Blaufus et al., 2015) and underestimate tax schedule progressiveness far less than men (Slemrod, 2006). However, there is also evidence that gender does not play a role in individuals' tax misperception at all (Ballard and Gupta, 2018; Fujii and Hawley, 1988; Gideon, 2014). Hence, we cannot predict the effect of gender on firms' tax rate misperception. (8)

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[31] Trust in the government has also a positive effect in other settings (see Eberhartinger et al. (2020), for a positive effect on tax bargaining; Kuziemko et al. (2015) and Stantcheva (2021), for a positive effect on the attitudes towards redistributive policies, and Slemrod (2006) for the assessment of the US tax system as fair).

Manager: According to the findings of Blaufus et al. (2015), entrepreneurs and employees show no difference in the misperception of income tax rates. Hundsdoerfer and Sichtmann (2009) show that about one-quarter of self-employed physicians do not know their MTR and Graham et al. (2017) find that managers confuse ATRs and MTRs within decision-making processes. These results indicate that working in an executive position does not necessarily imply a better understanding of tax concepts. Therefore, we assume that working in an executive position does not affect tax rate misperception.

We provide summary statistics of the before mentioned variables in Table 2.5 and a more granular summary statistic in Table B.2 in the Appendix B.2. Additional summary statistics by legal form are provided in the Appendix B.4.

TABLE 2.5: Summary Statistics of Drivers

Statistic	N	Mean	St. Dev.	Min	Median	Max
$ATR_{retained}$ Misp.	478	0.113	0.103	0.000	0.093	0.647
$ATR_{distributed}$ Misp.	478	0.126	0.105	0.000	0.111	0.647
$MTR_{retained}$ Misp.	478	0.102	0.108	0.00005	0.057	0.515
$MTR_{distributed}$ Misp.	478	0.113	0.113	0.0002	0.071	0.515
Employees	478	1.992	1.730	0.000	1.792	11.918
Corporation	478	0.264	0.441	0	0	1
Loss	478	0.184	0.388	0	0	1
Tax Assistance	478	0.906	0.292	0	1	1
Tax Knowledge Index	478	0.000	1.000	−2.381	−0.046	2.274
Tax Satisfaction Index	478	0.000	1.000	−5.798	0.001	2.847
Female	478	0.180	0.385	0	0	1
Manager	478	0.977	0.150	0	1	1

Notes: This table presents summary statistics of our variables used in the regression analysis. For sole proprietors and partnerships there is no difference between retained and distributed earnings. This display is only to illustrate differences in corporations' tax rate. Variable definitions and a more detailed version of this summary statistics can be found in Appendix A2.

In a first step, we analyze overall ATR and MTR misperception without distinguishing between over- and underestimation. The results of the regression analysis are shown in Table 2.6.

TABLE 2.6: OLS Regression of ATR and MTR Misperception

	Dependent variable:			
	$ATR_{retained}$	$MTR_{retained}$	$ATR_{distributed}$	$MTR_{distributed}$
	(1)	(2)	(3)	(4)
Employees	−0.007	0.008**	−0.007	0.008*
	(0.005)	(0.004)	(0.005)	(0.004)
Corporation	−0.070***	0.026	−0.040	0.042
	(0.021)	(0.022)	(0.027)	(0.029)
Employees x Corporation	0.003	−0.019**	0.011	−0.009
	(0.008)	(0.008)	(0.010)	(0.009)
Loss	0.015	0.012	0.007	0.001
	(0.013)	(0.014)	(0.014)	(0.014)
Tax Assistance	−0.001	0.001	−0.006	0.00001
	(0.016)	(0.015)	(0.018)	(0.016)
Tax Knowledge Index	−0.011***	−0.028***	−0.016***	−0.032***
	(0.004)	(0.004)	(0.004)	(0.005)
Tax Satisfaction Index	−0.028***	−0.015***	−0.026***	−0.011**
	(0.006)	(0.005)	(0.006)	(0.005)
Female	−0.011	−0.007	−0.001	0.001
	(0.011)	(0.012)	(0.011)	(0.013)
Manager	0.006	0.018	−0.013	0.002
	(0.018)	(0.029)	(0.030)	(0.038)
Constant	0.136***	0.074**	0.158***	0.091**
	(0.022)	(0.032)	(0.033)	(0.039)
Observations	478	478	478	478
R^2	0.203	0.121	0.102	0.097
Adjusted R^2	0.187	0.104	0.085	0.079

Notes: This table shows the OLS regression results of ATR and MTR misperception. The dependent variables in columns (1) and (2) represent the case where corporations report their ATR and MTR on retained profits, and the dependent variables in columns (3) and (4) represent the case where corporations report their ATR and MTR on distributed profits. All variables are defined in more detail in the Appendix B.2. Robust standard errors are in parentheses. * $p < .1$, ** $p < .05$, *** $p < .01$.

The regression analysis confirms that *Corporations* have a significantly lower extent of $ATR_{retained}$ misperception than non-corporations ($p < 0.01$). This is in line with our expectations and can be explained by the rather simple flat tax on retained earnings. However, if profits are distributed, this effect vanishes. This is because estimating their tax rate becomes far more complex due to the interplay of the taxes on the corporate and shareholder level.[32] *Employees* and *Employees x Corporation* show no significant effect on ATR misperception. In contrast to ATR misperception, there is no association between *Corporation* and MTR misperception at all. Further, MTR misperception is positively associated with *Employees* ($MTR_{retained}$ $p < 0.05$; $MTR_{distributed}$ $p < 0.1$) and $MTR_{retained}$ is negatively associated with *Employees x Corporation* ($p < 0.05$). Since the negative coefficient exceeds the positive coefficient of *Employees* we find larger corporations exhibit lower $MTR_{retained}$ misperception whereas the opposite holds true for non-corporations. Firm size - as in Graham et al. (2017)

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[32] These results are in line with findings of Abeler and Jäger (2015) and Rupert, Single, and Wright (2003) who point out that complexity alters individuals' behavior with regard to taxes.

- does not seem to be a good proxy for employing well-educated tax experts in our case, as we find only weak results for it in terms of MTR.

With regard to personal characteristics, we find that *Tax Knowledge Index* and *Tax Satisfaction Index* are highly significant both for retained and distributed profits ($p < 0.01$). Higher *Tax Knowledge* leads to less ATR and MTR misperception. Also, Graham et al. (2017) finds a negative association with accounting-related education among corporate tax managers, while the literature on individuals does not provide a clear pattern for education / tax knowledge (Gensemer, Lean, and Neenan, 1965; Slemrod, 2006; Rupert and Fischer, 1995; Blaufus et al., 2015; Ballard and Gupta, 2018; Fujii and Hawley, 1988; Gideon, 2014; Amberger, Eberhartinger, and Kasper, 2016). Higher *Tax Satisfaction* leads to less ATR and MTR misperception. This is consistent with Ballard and Gupta (2018) who examine individual misperception and find stronger misperception among respondents who believe they are taxed too high or who assume taxes are spent ineffectively. Other personal characteristics, which are known from the literature on individual misperception, such as gender or position in the firm do not have an effect.

After analyzing overall ATR and MTR misperception, we investigate over- and underestimation separately to decompose our findings on overall misperception. Table 2.7 shows our regression results of ATR and MTR misperception differentiated by over- and underestimation.

TABLE 2.7: OLS Regression of ATR and MTR Over-/Underestimation

| | ATR$_{\text{retained}}$ | | MTR$_{\text{retained}}$ | | ATR$_{\text{distributed}}$ | | MTR$_{\text{distributed}}$ | |
| | Over | Under | Over | Under | Over | Under | Over | Under |
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Employees	−0.021***	0.020***	−0.012**	0.015***	−0.021***	0.020***	−0.012***	0.016***
	(0.004)	(0.007)	(0.005)	(0.005)	(0.004)	(0.007)	(0.005)	(0.006)
Corporation	−0.098***	0.053*	0.035	−0.017	−0.097***	0.108***	0.015	0.048
	(0.019)	(0.029)	(0.022)	(0.031)	(0.029)	(0.032)	(0.033)	(0.034)
Employees x Corporation	0.016**	−0.022**	−0.002	−0.016	0.022***	−0.017	0.007	−0.013
	(0.006)	(0.010)	(0.007)	(0.011)	(0.008)	(0.011)	(0.008)	(0.011)
Loss	0.032**	0.011	0.027	−0.012	0.023	−0.0001	0.004	−0.018
	(0.015)	(0.014)	(0.017)	(0.020)	(0.017)	(0.017)	(0.019)	(0.019)
Tax Assistance	0.025*	−0.009	0.021	0.0004	0.016	0.003	0.010	0.014
	(0.014)	(0.020)	(0.017)	(0.022)	(0.015)	(0.028)	(0.018)	(0.022)
Tax Knowledge Index	−0.006	−0.016***	−0.005	−0.042***	−0.008*	−0.024***	−0.003	−0.047***
	(0.004)	(0.006)	(0.004)	(0.006)	(0.005)	(0.008)	(0.005)	(0.007)
Tax Satisfaction Index	−0.037***	0.014**	−0.030***	−0.007	−0.041***	0.016*	−0.031***	−0.005
	(0.007)	(0.007)	(0.006)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)
Female	−0.017	0.022	−0.020*	0.010	−0.011	0.025	−0.009	0.009
	(0.013)	(0.017)	(0.012)	(0.019)	(0.013)	(0.021)	(0.012)	(0.020)
Manager	0.016	−0.051**	0.009	0.016	0.008	−0.199***	−0.009	−0.007
	(0.014)	(0.021)	(0.023)	(0.041)	(0.019)	(0.028)	(0.042)	(0.049)
Constant	0.126***	0.060*	0.062**	0.085*	0.143***	0.197***	0.091**	0.093*
	(0.020)	(0.035)	(0.029)	(0.044)	(0.024)	(0.049)	(0.046)	(0.051)
Observations	380	98	245	233	347	131	219	259
R^2	0.307	0.356	0.206	0.194	0.260	0.314	0.151	0.163
Adjusted R^2	0.290	0.290	0.176	0.161	0.240	0.263	0.114	0.133

Notes: This table shows OLS regression results of ATR and MTR misperception, which is divided into overestimation and underestimation. The dependent variables in columns (1)-(4) represent the case where corporations report their ATR and MTR on retained profits, and the dependent variables in columns (5)-(8) represent the case where corporations report their ATR and MTR on distributed profits. Note, that underestimates like overestimates have a positive sign. All variables are defined in more detail in the B.2. Robust standard errors are in parentheses. * $p < .1$, ** $p < .05$, *** $p < .01$.

Overall, we find that larger firms report significantly lower ATR and MTR as they show less overestimation but more underestimation ($p < 0.01$; $p < 0.05$). Since the interaction effect of *Employees x Corporation* attenuates the size effect in case of the ATR, the size effect is only prevalent for non-corporations, i.e. they are less likely to overestimate and more likely to underestimate the ATR as their size increases. This is partially in line with our argumentation that a more salient tax rate leads to less misperception. *Corporations* overestimate ATR significantly less than non-corporations ($p < 0.01$). We argue that this effect is due to the complexity of the tax system created by the progressive income tax schedule and the complex interaction of IT and TT. However, this effect does not show up in MTR estimates because the (higher) benchmark MTRs (42%/45%) for non-corporations are more salient. *Tax Assistance* and *Loss* are no robust drivers of ATR or MTR over- and underestimation. It is possibly induced by our design that *Loss* has hardly an effect on tax rate misperception. Since we lack information on tax loss carryforwards, actual tax rates are calculated without offsetting losses. The absence of a difference between loss-making and profit-making firms indicates that firms asked to estimate the tax burden on a given profit may neglect the tax-reducing effect of tax loss carryforwards.

Personal characteristics like the assessment of the German tax system are important to be considered as well. *Tax Satisfaction Index* has a negative effect on the overestimation of ATR and MTR ($p < 0.01$) and no or a positive effect on the underestimation of ATR and MTR. Overall, firms tend to incorporate their satisfaction with the German tax system by assessing their tax burden as relatively lower. Ballard and Gupta (2018) find similar results for individuals. *Tax Knowledge Index* has no effect on ATR and MTR overestimation but a significant negative effect on the underestimation of ATRs and MTRs ($p < 0.01$). An interesting pattern emerges from this: Overestimates seem to be driven more by a dissatisfaction with the tax system and underestimates by a lack of knowledge. Being a *Female* or *Manager* has no robust effect. *Managers* tend to underestimate ATRs ($p < 0.05$) less.

In sum, both firm and personal characteristics play a role. With respect to firm characteristics, we can confirm that the complexity of the legal form-related taxation and the interaction of taxation at different levels increase tax rate misperception. With regard to personal characteristics, satisfaction with the tax system and, unsurprisingly, tax knowledge are relevant factors.

2.4.3   Tax Rate Choice

Our results illustrate so far that firms struggle with estimating their tax rates appropriately and understanding the underlying tax schedule. Therefore, the question arises if and how this misperception might translate into firms' behavior. Graham et al. (2017) have already shown that even managers of large public and private corporations often do not use their

firm's MTR in their decision processes.[33] Following this approach, in a first step, we investigate which tax rates our surveyed firms incorporate in their business decisions.[34] Our respondents could choose from different common tax rate alternatives: ATR, MTR, statutory tax rate (STR), self-defined tax rate (self-set), or another tax rate (other). Figure 2.9 presents the tax rates used in investment decisions per legal form:

FIGURE 2.9: Tax Rate Choice by Legal Form
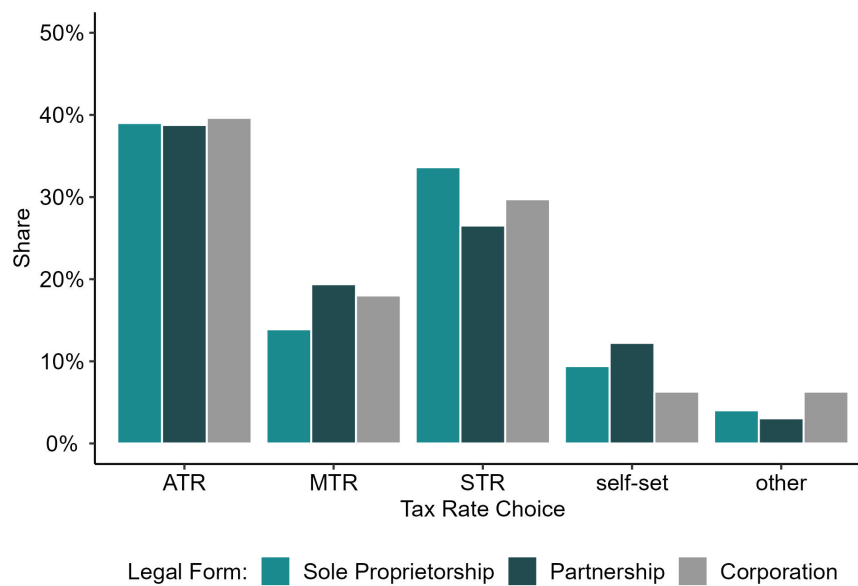
Notes: This figure shows the average shares of chosen tax rates in investment decisions (N = 432).

We find the ATR as the most common tax rate incorporated in investment decisions and confirm the results of Graham et al. (2017) for a sample of primarily small and medium-sized German firms. About 40% of the firms over all legal forms use their ATR in the decision-making process. Less than 20% use their MTR.[35] This indicates that managers like individuals struggle with the concept of MTRs.[36] Roughly 12% of our firms do not consider taxes in investment decisions at all which is also in line with Graham et al. (2017).

To avoid biased decisions, using MTRs in investment decisions is especially important for firms that are subject to the progressive income tax schedule. Therefore, it is striking that we do not find more obvious differences between the share of corporations and non-corporations choosing the MTR.

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[33] Depending on the type of business decision only 8.8% to 12.5% of the surveyed managers use the MTR.

[34] For this purpose, we ask our respondents: "Which of the following tax rates do you use in your investment decision?" We also analyze whether firms incorporate taxes in their investment decisions at all.

[35] Related, Hüsing (1999) and Wittmann (1986) illustrate that firms do not consider taxes appropriately in business decisions and Bartolome (1995) provides evidence that individuals' often use the ATR instead of the MTR as well. But, using average instead of marginal figures appears not only in a tax setting. Shin (1985) finds that the average price predicts electricity demand better than the marginal price. Faulhaber and Baumol (1988) indicate, at least until the 1970s, most firms use average rather than marginal costs in their pricing decisions.

[36] For individuals Gideon (2014) (p. 26) concludes: "The main take-away from analyzing heterogeneity is the general cluelessness about marginal tax rates."

In a second step, and to further analyze associations between firm and personal characteristics and tax rate choice, we perform logit regressions.

$$Tax\ Rate\ Choice_i = \alpha + \beta \cdot Drivers_i + \epsilon_i \tag{2.10}$$

The dependent variable *Tax Rate Choice* comprises the specification *Choice ATR* (equals one for firms that chose the ATR), *Choice MTR* (equals one for firms that chose the MTR), and *Choice STR* (equals one for firms that chose the STR). We choose the independent variables based on Graham et al. (2017) in case they are on hand for our sample. This way, we can examine whether German firms, especially firms of different size, show similar patterns as found by Graham et al. (2017). Further, we account for tax rate misperception via *Tax Misperception Index*. *Tax Misperception Index* incorporates *ATR Misperpercetion*, *MTR Misperception*, and *Tax Schedule Misperception*. Our regression results are displayed in Table 2.8.

TABLE 2.8: Logit Regression of Tax Rate Choice - Investment Decision

	Dependent variable:		
	Choice ATR	Choice MTR	Choice STR
	(1)	(2)	(3)
Employees	0.030	0.082	−0.155**
	(0.071)	(0.086)	(0.077)
Loss	0.218	−0.776	0.025
	(0.272)	(0.473)	(0.290)
Corporation	0.060	−0.484	0.303
	(0.262)	(0.378)	(0.277)
Business Decisions	0.037	−0.025	−0.079
	(0.101)	(0.137)	(0.105)
Tax Knowledge	−0.460*	0.875*	0.102
	(0.250)	(0.466)	(0.267)
Tax Complexity	0.292*	0.259	−0.465***
	(0.175)	(0.237)	(0.165)
Female	−0.235	0.158	0.077
	(0.278)	(0.361)	(0.284)
Manager	−0.320	0.573	0.283
	(0.678)	(1.112)	(0.731)
Tax Assistance	0.472	−0.784*	0.221
	(0.414)	(0.425)	(0.428)
Misperception Index	−0.007	−0.605***	0.293**
	(0.109)	(0.154)	(0.117)
Constant	−1.825	−2.482	0.845
	(1.181)	(1.708)	(1.172)
Observations	416	416	416
Log Likelihood	−271.498	−166.561	−250.261
Akaike Inf. Crit.	564.996	355.122	522.522

Notes: This table shows logit regression results of *Choice ATR*, *Choice MTR* and *Choice STR*. All variables are defined in more detail in the Appendix B.2. Standard errors are in parentheses. * p < .1, ** p < .05, *** p < .01.

We find that *Employee* is negatively associated with choosing the STR ($p < 0.05$). An explanation could be that bigger firms have their own tax departments, which determine and report rather ATRs and MTRs than STRs. These ATRs and MTRs are than used within the decisions-making process. Further, perceived *Tax Complexity* is slightly positively associated with using the ATR in investment decisions ($p < 0.1$), but negatively with using the STR ($p < 0.01$). The reason could be that respondents rather use heuristics that are closer to the ATR. They seem to feel more confident in relying on their ATR than knowing what the (combined) STR is. Furthermore, we find that hiring *Tax Assistance* is significantly negatively correlated with choosing the MTR ($p < 0.05$). Obviously, using advisory services is associated with outsourcing tax knowledge. This in turn leads to respondents knowing less on how to properly incorporate taxes into the decision-making process (for individuals it is shown that tax assistance increases their tax rate misperception (Ballard and Gupta, 2018; Gideon, 2014; Rupert and Fischer, 1995)). Further, having *Misperception* is negatively related with using the MTR ($p < 0.01$) and positively related with using the STR ($p < 0.05$). An explanation could be, that having trouble understanding the tax rate schedule and having trouble reporting the firms actual tax rate, leads to choosing a more general figure, namely the STR.

Our results clearly illustrate that tax rate misperception biases tax rates used in investment decisions and, hence, might also result in distorted investment decisions. Building on our findings on tax rate misperception also indicates that there are two channels through which misperception enters into investment decisions, first, the magnitude of ATR or MTR misperception and, second, misperception on which tax rate to apply. It is therefore necessary to examine the interaction of tax rate misperception and tax rate choice in investment decisions in a third step. By doing this, we expand the study of Graham et al. (2017) by adding an additional layer. We proceed as follows: First, we group firms based on their tax rate choice.[37] Second, we compare the individually *reported tax rate* (ATR or MTR) which is, according to the respective, used in the investment decision with the actual MTR of each firm. Third, we evaluate our findings. Based on our previous approach, we define deviations of ± 5pp from the actual MTR as still accurate. In Table 2.9 we illustrate our results.

TABLE 2.9: Chosen Tax Rate vs. Actual MTR

	Beneath corridor	Within corridor	Above corridor
	N = 63	N = 123	N = 53
Choice ATR (39.1%)	31.4%	44.4%	24.3%
Choice MTR (16.2%)	14.3%	68.6%	17.1%
	26.4%	51.5%	22.2%

Notes: This table describes the firms' reported tax rate considered in investment decisions and compares it to the actual MTR of the firm. Within the corridor is defined as a deviation of less than ± 5pp of the *reported tax rate* from the firms' actual MTR. If the deviation is larger we classify the *reported tax rate* as beneath or above the corridor of the actual MTR.

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[37] We only compare the reported ATR and MTR since we cannot determine the STR respondents thought of when choosing the STR (see Figure 2.9).

Table 2.9 describes an interesting phenomenon: The negative effects of using the ATR instead of the MTR in investment decisions, can be attenuated or even balanced by firms' tax rate misperception. Since firms tend to overestimate their ATRs, their estimated ATR deviates less than ±5pp from their actual MTR (in 44.4% of the cases) and hence, firms use the appropriate tax rate due to ATR misperception. Therefore, misperception needs to be considered as an additional feature when estimating the cost of using inappropriate tax rates in business decisions. However, misperception results in using inappropriate tax rates in 31.4% of firms which use the MTR in investment decisions. Overall, 51.5% of our ATR/MTR firms use the accurate tax rate in investment decisions. In addition to investment decisions, we also asked about financing decisions. For finance decisions the results are similar.

2.5   Conclusion

In this study, we explore whether and to what extent firms in the legal form of sole proprietorships, partnerships, and corporations misperceive their tax rates. Further, we examine drivers of tax rate misperception and the link between tax rate misperception and business decisions. We adopt an innovative approach in which (1) firms estimate their ATR and MTR based on a *given profit* and (2) we calculate actual ATRs and MTRs to benchmark reported tax rates (for non-corporations incorporating values from the Official Tax Statistics). This approach yields robust estimators of firms' tax rate misperception.

We find a large share of firms misperceiving their tax rates: More than 60% (50%) misperceive their ATR (MTR). Corporations are better in estimating their tax rates for retained profits which might be explained by the simple flat tax rate structure. Nevertheless, more than 40% of corporations misperceive their ATR and MTR by more than ±5pp. This share even increases to about two thirds when distributed profits are considered. We assume this to be explained by the complexity added through taxation of shareholders. While corporations, on average, underestimate both tax rates on distributed profits over- and underestimates for retained profits nearly offset each other. In contrast, non-corporations show a different pattern of misperception: ATRs are overestimated, while MTRs are underestimated. Next to this tax rate misperception, we find that more than half of non-corporations misperceive the relation of ATRs to MTRs induced by the progressive German income tax schedule. Non-corporations strongly tend to linearize the tax schedule. Even though corporations are subject to a flat tax structure, one quarter misperceives the relation between ATRs and MTRs. Further, our results illustrate that if one tax rate is misperceived so is the other.

In a second step, we identify drivers of misperception: Legal form, the size as well as tax knowledge and satisfaction with the tax system influence the degree of misperception. In a third step, we analyze the link between tax rate misperception and tax rates which are considered in investment decisions. First, in line with previous literature, we demonstrate that firms most frequently use ATRs in their investment decisions – instead of using the

appropriate MTR. But, we are the first to show, that this effect is attenuated by tax rate misperception. Due to overestimation of their ATR, around 40% of these firms use unintendedly their actual MTR, leading to less bias in investment decisions than expected.

Our findings strongly contribute to closing the existing research gap on firms' tax misperception and answer to Blaufus et al. (2022) call for further research. Quantifying tax rate misperception helps to predict firms' behavior in response to taxes and tax reforms more accurately. Still, there is need for further research: Amongst others, it seems especially promising to develop a model allowing to include heterogeneous tax rate misperception in real effect analyses.

3 (Mathematical) Complexity and Preferences for Taxation: The Case of Wealth Taxation

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Abstract

It is well documented that humans have difficulties in understanding nonlinear growth. This paper explores to what extent this type of bounded rationality translates into preferences for specific wealth-tax designs. In particular, we quantify shifts in stated preferences for wealth taxation caused by misperceived burden consequences of commonly politically discussed tax parameters: tax allowances and tax rates. For this, we conducted a randomized survey experiment with over 1,200 respondents in Germany. In a 2x2 design, our respondents were randomly selected to indicate both their preferred tax allowance and tax rate for either a yearly or a one-time wealth tax. Our treatment group was provided with easy-to-understand information on the resulting total tax burden for the respective wealth tax instrument. We find the preferred effective tax rate drops by almost 15 percentage points for a yearly wealth tax if our participants are fully informed, whereas we do not find this effect for the one-time wealth tax. We argue that both the total tax burden and the perceived feasibility of single payments are factors that form preferences for tax parameters.

3.1   Introduction

The individual capacity to form personal preferences constitutes an essential element of the democratic process. At the same time, policies with far-reaching consequences often require profound expertise. Taxation is such an example. Tax instruments are mostly communicated in tax rates (i.e. percentages) that are applicable to a specific tax base. Determining the actual tax burden consequences quickly becomes a relatively complex endeavour: Ample evidence shows that the general population misperceives percentages (Tversky and Kahneman, 1973) and fails to understand nonlinear growth (Wagenaar and Sagaria, 1975). These most fundamental (mathematical) mechanisms are subject to almost all types of tax instruments. For example, the cumulative effect of changing tax bases due to frequent and sequential tax points is subject to the property tax, financial transaction tax, taxes in dividend-payouts etcetera. In principle, national tax systems in their entirety operate in a cumulative manner, which is arguably hard to grasp, even by professionals (Saez and Zucman, 2019b).

Indeed, a large majority of individuals perceive taxes as overly complex (Blesse, Buhlmann, and Dörrenberg, 2020). This does not only lead to significant confusion and well-documented suboptimal behavioral responses (Chetty, Saez, and Friedman, 2013; Feldman, Katuščák, and Kawano, 2016). It also raises questions about the validity of politically expressed preferences for insufficiently understood tax instruments. In other words, misperception due to complexity potentially biases the voters' political will and thus results in political outcomes other than intended (Fishkin, 1997). In this respect, policy makers could exploit the underestimation of less salient taxes and thus collect taxes beyond what informed voters would allow for - a mechanism thoroughly discussed under the term "fiscal illusion" (Mill, 1848; Chetty, Looney, and Kroft, 2009; Finkelstein, 2009; Cabral and Hoxby, 2012). This paper explores to what extent stated preferences on fundamental tax parameters (i.e. tax rates and allowances) are biased due to the mathematical complexity of calculating tax burden consequences (i.e. the large cumulative effect of a small but recurring tax rate). For this, we employ the example of wealth taxation.

Wealth taxes, mostly in form of estate or inheritance taxes, have been widely abolished over the recent decades (Drometer et al., 2018). Yet, due to recent developments in increased concentration of private wealth (Alvaredo et al., 2013; Piketty, 2015; Saez and Zucman, 2016), economists emphasize the need for a well enforced wealth tax to restore overall progressivity of tax systems (Saez and Zucman, 2019a). This development was even further accelerated by negative effects of the Covid-19 pandemic (Angelopoulos et al., 2021), accompanied by increased government expenditures to counteract negative effects of the crisis. It is therefore not surprising that the public debate on introducing a wealth tax recently gains momentum in many countries. This time, however, in form of a yearly wealth tax: during the 2019/2020 Democratic presidential nomination campaign in the US, the introduction of a yearly wealth tax of 2% p.a. has been discussed; the Social Democrats in Germany proposed a 1% p.a. wealth tax in their electoral campaign (SPD, 2020) and the UK set up the Wealth

Tax Commission to provide analysis of wealth tax proposals. In its final report, the commission documents that most people are in favor of introducing a yearly wealth tax if the state has to collect more money.[1] Although most people prefer a combination of a tax allowance of £500,000 and a tax rate of 1% p.a., 42% of respondents even indicate rather high tax rates of "3%" or "more than 3%" p.a. (Rowlingson, Sood, and Tu, 2021).

The reasons for different preferences towards different wealth tax instruments are manifold and well-studied. Previous literature mainly centered around: normative preferences (Alesina and Angeletos, 2005; Weinzierl, 2017; Alesina, Stantcheva, and Teso, 2018; Almås, Cappelen, and Tungodden, 2020; Fisman et al., 2020); efficiency concerns (Fisman, Jakiela, and Kariv, 2017; Capellen, Halland, and Tungodden, 2019; Stantcheva, 2021); misinformation/framing (Piketty, 2015; Benabou and Ok, 2001; Bartels, 2006; Birney, Graetz, and Shapiro, 2006; Graetz and Shapiro, 2006); and finally the factual knowledge about the tax legislation and its objective (Krupnikov et al., 2006; Slemrod, 2006; Cruces, Perez-Truglia, and Tetaz, 2013; Kuziemko et al., 2015; Blesse, Buhlmann, and Dörrenberg, 2020; Chirvi and Schneider, 2019; Stantcheva, 2021; Bastani and Waldenström, 2021).

However, a dimension that has not been studied yet, is, the role of bounded rationality due to mathematical complexity induced by fundamental tax design features. Or, put differently: the narrowly defined question of how individuals fail to interpret the actual consequences of the parameters commonly used to characterize a tax system.

In order to identify this specific effect of bounded rationality, we implemented a tightly controlled online experiment in a 2x2 design with over 1,200 respondents in Germany. These respondents were randomly assigned into one of the two wealth tax instrument groups: a yearly wealth tax and a one-time wealth tax. All respondents were presented with the same case of hypothetical persons differing only in their wealth. For these persons, they were asked to indicate their preferred tax allowance and tax rate with respect to the respective tax instrument. The treatment group received information about the resulting tax burden consequences through an easy-to-understand interactive pie chart. Comparing informed to uninformed wealth tax groups, we are able to quantify the effect of misperceived tax burden consequences induced by mathematical complexity.

We use the example of wealth taxation for the sake of its rather simple character. Since our research question targets the fundamental characteristics of a general wealth taxation, we refrain from examining very particular types of tax instruments, such as the inheritance tax, the estate tax or the property tax. These taxes have very specific characteristics such as the context of the levied tax (the decedent's death in case of the inheritance and estate tax) or the limited tax basis (real estate in case of the property tax). While the impact of such specific characteristics on perceptions and preferences is documented by related research (see e.g., Chirvi and Schneider, 2019; Kuziemko et al., 2015, for the estate tax), our focus is on a more general applicable pattern of misperception. Thus, our findings are transferable to different types of taxes. For this reason, we have chosen two different general wealth tax

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[1] For further information, see `https://www.ukwealth.tax/` (07.06.2022).

instruments: a yearly wealth tax and a one-time wealth tax. Since these types of taxes only differ in the number and timing of tax levies, they can be generally compared on the basis of their effective tax burden - which is defined as the cumulative tax burden over a person's lifetime.

Our respondents indicate preferred levels of wealth taxation varying from 15.2% to 54.6% effective tax burdens across tax instruments. While we do not find misperceptions regarding a one-time wealth tax, preferences for a yearly wealth tax are strongly biased by misperceived tax burden consequences of the tax parameters. Respondents favor tax parameters for the yearly wealth tax that lead to effective tax rates of 54.6%, although they actually only consider an effective tax burden of 40.0% to be "fair" if they are informed about the tax burden consequences. Resolving computational deficiencies, we still find differences in informed preferences between the two wealth tax instruments. As even for informed respondents the indicated effective tax burdens of a yearly wealth tax are much higher than of a one-time wealth tax (40.0% vs. 15.2%), we conclude that our participants generally prefer a tax system with regular small installments over one with only one concentrated and thus larger amount payable. Since our experiment abstracts from many real-life aspects (e.g., source of wealth or inconsistent growth of wealth), our latter finding on informed preferences does not claim to fully explain political preferences. This, however, does not affect the strong internal validity of our first finding on misperceived tax burdens.

We are not aware of any previous literature quantifying the effect of computational deficiencies on preferences in the context of wealth taxation. Specifically, this study investigates computational deficiencies induced by the complex cumulative effect of a periodic wealth tax compared to a one-time wealth tax. It reflects on how humans have fundamental cognitive difficulties related to nonlinear growth. Wagenaar and Sagaria, 1975 show that all individuals underestimate nonlinear growth to a large extent: two-thirds of their participants stated estimates below 10% of the true value. Interestingly, they point out how this misperception is seemingly hard-wired into their respondents. Not even instructions and experience were able to compensate this cognitive bias. Lammers, Crusius, and Gast, 2020 square this behavioral effect with the support and opposition to public policy measures, i.e. the support for social distancing in relation to people's misperception of the virus' exponential growth.[2] Furthermore, our project connects to a managerial literature on salience of increased prices. Smaller but regular payments of service prices lead to higher payments (Della Vigna and Malmendier, 2006; Iyengar et al., 2011). Finally, based on the conclusion that misperception indeed exists for all sorts of taxes, Blaufus et al., 2022 develop a "behavioral taxpayer response model" to allow for a more differentiated view on the reasons of misperceptions: even if objective tax information such as tax rates and tax bases are available, taxes may be misperceived e.g. due to bounded rationality of individuals. Our project focuses on bounded rationality induced by mathematical complexity.

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[2]   Lammers, Crusius, and Gast (2020) show that their participants perceived exponential growth rather as linear growth. Improving the statistical literacy with information about exponential growth increased the support for social distancing policies.

The rest of the paper is organized as follows: in Section 3.2, we compare both wealth tax instruments and develop our hypotheses. Section 3.3 gives a detailed description of our experimental design and Section 3.4 describes the data collection and data sample. In Section 3.5 results are presented, followed by a brief discussion and concluding remarks.

3.2 Wealth Tax Instruments & Hypotheses

3.2.1 Comparability of Wealth Tax Instruments

We focus on a general setting because specific types of wealth taxes may be affected by their incidence (e.g., the death in case of the estate / inheritance tax) or their tax basis (e.g., the property tax that only includes real estate). For this reason, we analyze two different instruments of a *general* wealth tax which is levied on individuals' net wealth including all types of assets: a yearly wealth tax and a one-time wealth tax. As they differ only in the number and timing of the tax collection, they are generally comparable on the basis of their effective tax burden. Both wealth tax instruments have already been implemented in different countries and are frequently considered in recent policy discussions.

The burden of a wealth tax depends on three parameters: the tax basis, the tax rate and the tax allowance. As most wealth taxes are levied on individuals' net wealth, the tax basis is usually calculated as the total value of assets minus liabilities. Furthermore, specific assets are (partially) exempted from taxation. In our experiment, we present a taxable net value of assets to keep it as simple as possible.

As a yearly wealth tax is repeatedly levied in a person's life, we have to account for wealth accumulation over a person's lifetime. Looking at empirical data, wealth stocks are usually growing over time. In the absence of any tax this accumulation process can be described as a *savings plan* that determines the amount saved each year (s_n). In this paper, we define such a *savings plan* as corresponding to a growth rate (r) in the absence of any wealth tax.

$$s_n = r \cdot I_0 \cdot (1+r)^{(n-1)} \tag{3.1}$$

In our experiment, we explicitly present respondents with such a savings plan by specifying the initial and final value of a person's assets.

Another related issue refers to the question whether respondents differentiate between nominal and real values of wealth. As a life-cycle extends over several decades, it is not straightforward to compare values at different points of time. However, as our scenarios are not linked to calendar years and are presented in a time-neutral way, we do not expect any misconception in this regard.

Based on the proposed tax parameters a one-time wealth tax and a yearly wealth tax can be compared by using measures such as future value (*FV*). In the absence of any taxes, the future value of an initial asset stock I_0 that grows for N years (e.g., until the end of one's life)

by accumulated savings can be easily calculated by:

$$FV_N = I_0 + \sum_{n=1}^{N} s_n \tag{3.2}$$

Regarding a one-time wealth tax with tax rate τ_o and tax allowance α_o that is levied once at the end of one's lifetime (N), the formula has to be modified:

$$FV_{N,o} = \left(I_0 + \sum_{n=1}^{N} s_n\right) - max\left[\left(I_0 + \sum_{n=1}^{N} s_n\right) - \alpha_o, 0\right] \cdot \tau_o \tag{3.3}$$

The wealth accumulated over N years is reduced by the one-time wealth tax, which is levied on one's net wealth exceeding the tax allowance.

Regarding a yearly wealth tax with a tax rate τ_y and a tax allowance α_y, we need to consider that the tax payments reduce the net wealth at the end of every year n:

$$FV_{1,y} = I_0 + s_1 - max[I_0 + s_1 - \alpha_y, 0] \cdot \tau_y$$

$$FV_{2,y} = FV_{1,y} + s_2 - max[FV_{1,y} + s_2 - \alpha_y, 0] \cdot \tau_y$$

$$...$$

$$FV_{N,y} = FV_{N-1,y} + s_N - max[FV_{N-1,y} + s_N - \alpha_y, 0] \cdot \tau_y \tag{3.4}$$

The effective tax rate (ETR) of each tax instrument can then be calculated based on the FV before and after the respective tax:

$$ETR = \frac{FV_N - FV_{N,tax}}{FV_N} \tag{3.5}$$

$$with \quad tax \in \{y, o\}$$

Due to the fact that we are setting a fixed *savings plan* for wealth accumulation, this model has some limitations that we want to address. Introducing a yearly wealth tax, two effects on the accumulated wealth stock have to be distinguished: first, the direct burden or "first round effect" of the tax. This burden is defined as the total sum of wealth tax payments during one's lifetime (effective tax burden). Second, the indirect burden or "second round effect" of the tax due to behavioral response. As the yearly wealth tax is levied every year, it might affect the *savings plan*. Lower saving rates may be a consequence if the tax cannot be offset by additional income or a reduction in consumption. Hence, the wealth accumulation process itself may be decelerated.

In this study, we will only consider the "first round effect" due to several reasons. First, to analyze the "second round effect" one has to make assumptions about how taxpayers will respond to the introduction of such a tax. This is not straightforward, as the results of the empirical literature on behavioral responses show that the elasticity of taxable wealth varies

enormously, ranging from 0.054 to 43.2. However, the specific effect on saving behavior tends to be small (see literature review, Advani and Tarrant, 2021). Second, we would need to make sure that our respondents follow these assumptions even in a setting with a brief hypothetical description on a taxpayer's situation and intuitively consider them when responding to our survey. Third, neglecting the "second round effect" does not counteract our research design. If the elasticity of saving is zero, our results represent the total effect. But even if this is not the case, we simply report the lower bound of the true wealth tax burden and, consequently, the treatment effect we aim to identify.

3.2.2 Hypotheses

In comparison, a yearly wealth tax is much more complex than a one-time wealth tax, as shown in Section 3.2.1: the yearly wealth tax comprises n tax payments, each of which is based on a varying tax base F_{n-1} and thus generates a nonlinear relationship between tax rate and tax burden. Based on the emphasis on smaller single payments squared with the well-documented incapacity to process non-linear growth rates (i.e. underestimation) (Wagenaar and Sagaria, 1975), we form the following first hypothesis:

H1. *Respondents underestimate the tax burden of the yearly wealth tax due to its comparatively high (mathematical) complexity and therefore indicate higher preferred tax rates.*

Hence, uninformed respondents might perceive both taxes differently. For those who are informed about the cumulative effect of the yearly wealth tax, we hypothesize:

H2. *Given the economic equivalence in tax bases informed individuals in the yearly wealth tax group should not differ in their effective tax burden preferences from the one-time wealth tax group.*

It is, however, less straightforward how preferences between periodic taxes and concentrated taxes are shaped once complexity is resolved, and – if respondents yield preferences beyond the mere burden-equivalence. For the case of wealth taxation, Chirvi and Schneider, 2019 find indications that individuals form design-specific preferences for wealth taxation beyond mere tax burden considerations. When asked about a preferred overall lifetime-tax burden, evidence for preferences between periodic and concentrated taxes is mixed along partisan lines in the US. However, the direct comparison given a fixed tax burden reveals a clear preference for periodic taxation. A strand of literature documents and analyzes opposition to the estate tax that is partially due to dynastic motives (Cremer and Pestieau, 2006). Given our setting, respondents might interpret a one-off tax at a high age as a type of estate tax or confuse both taxes.

Further, a rather small body of literature finds smaller installments of tax payments as simply more feasible for the taxpayer: In the realm of public finance, Yaniv, 1999 shows how a number of smaller, advanced tax payments increases tax compliance. Highfill, Thorson, and Weber, 1998 points out that uncertainty about the actual tax liability leads to suboptimal withholding responses resulting in interest-free loans for the government (to avoid penalties). Thus, more frequent tax assessments would allow the taxpayer to better plan their

liability and result in more optimal withholding. Kelly, 2012 proposes to reform the property tax towards allowing multiple installments (through automatic bank payment systems) reducing the size of the single tax bill (while maximizing convenience for the taxpayer).[3]

3.3   Experimental Design

The calibration of an allowance and a tax rate is crucial for determining the total amount of a wealth tax. Furthermore, it is noteworthy that wealth tax proposals usually specify general tax allowances as well as tax rates. Precise tax amounts in exemplary cases are not illustrated. Hence, asking for these tax parameters appears to be the most appropriate tool to mirror the common political discourse on decisive dimensions that are crucial for the voting outcome.

We ask our respondents to state tax parameters of a hypothetical person for three different scenarios with a fixed *savings plan* decoupled from taxation. In our design, we simply impose a specified savings plan, which remains independent of the preferred wealth tax. This way, we avoid wealth accumulation being purely based on the interest on the capital stock. With such an imposed savings plan, respondents do not have to worry about the capital gain missed due to the wealth tax.[4] To keep the presented scenarios realistic and to account for periods of education with zero savings, wealth accumulation in our scenarios starts at the age of 30.[5] As an upper limit, we chose the age of 80 which represents the rounded value of life expectancy in Germany.[6] In order to capture a potentially desired progressivity and to analyze a broader range of wealth levels, we chose three different levels of wealth accumulations:[7]

- initial wealth stock of € 130,000 and final wealth stock of € 350,000
- initial wealth stock of € 1,100,000 and final wealth stock of € 3,000,000
- initial wealth stock of € 4,000,000 and final wealth stock of € 10,800,000

This variation also reduces the risk of obtaining a larger share of responses with preferred tax exemptions above the wealth indicated in the survey.

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[3]   We also acknowledge the vast literature on the underlying behavioral mechanisms leading up to these effects, for example, hyperbolic discounting (Thaler, 1981), mental accounting (Thaler, 1999) or concentration bias (Kőszegi and Szeidl, 2013). However, the exploration of how these mechanisms directly translate into preferences for tax designs is beyond the scope of this paper.

[4]   As the yearly wealth tax is levied every year, it it is necessary to provide clear assumptions about the lifetime accumulation of wealth. At the same time, we want to keep differences between groups as small as possible. Hence, we mention this wealth accumulation in all groups, i.e. also in case of the one-time wealth tax.

[5]   People under 30 have very low levels of wealth, on average only € 4,000 to € 24,000, `https://m.bpb.de/nachschlagen/zahlen-und-fakten/soziale-situation-in-deutschland/61778/vermoegen-in-west-und-ostdeutschland` (07.06.2022).

[6]   It represents a rounded average number for women and men with an age of 20-40 years, see Table 12621-0002 at `https://www.genesis.destatis.de/genesis/online` (07.06.2022).

[7]   The initial wealth stocks are chosen based on the net wealth distribution in Germany: the 75th percentile (about € 130,000), the 99th percentile (about € 1,100,000) and the 99.9th percentile (about € 4,000,000), see Schröder et al., 2020.

For some respondents, questions about taxation may be challenging as they are not familiar with this topic. Therefore, we provide information about central concepts, i.e. the calculation of both taxes and wealth accumulation. To make sure our respondents read and understand our explanation we asked control questions. This information on "Understanding Taxes" and "Understanding Growth" forms the Part I and Part II of our survey (see Figure 3.1). Our respondents generally show a very good understanding of the two concepts. Each control question was answered correctly by more than 90% of all respondents.[8]

In Part III of our survey, respondents are randomized in one of four groups: In the *yearly* wealth tax groups (control group: C_y and treatment group: T_y), respondents have to state their preferred tax allowance and tax rates in case of a yearly wealth tax. In the *one-time* wealth tax groups (control group: C_o and treatment group: T_o), the same parameters have to be stated in case of a one-time wealth tax. Before our respondents answer, we briefly give all groups some information on the respective tax instrument, i.e. that all assets are included in the tax basis and how it is levied. Following this introductory information, our respondents reach the main part of the survey. We standardize this part and vary only the name of the respective tax. Presenting the whole text on one single page, we first ask for the preferred tax allowance and then ask for the preferred tax rate for each of the three scenarios. The exact description of our scenarios as well as the wording of the question can be seen in Figure 3.2.

FIGURE 3.1: Survey Flow.
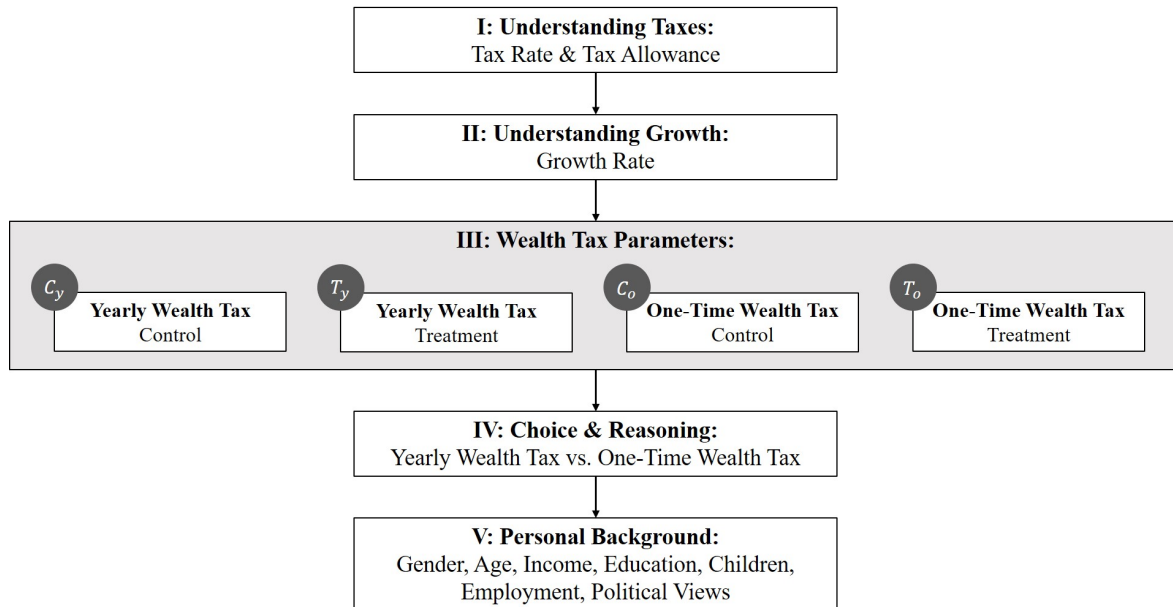
Note: This figure illustrates the survey flow. The survey consists of five parts. Part III is the main part where respondents are randomized in four different experimental groups. The full survey questionnaire is provided in Appendix C.1.

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[8] The two questions about taxes are answered correctly by 95.8% and 94.6%, the question about growth is answered correctly by 92.6% of all respondents.

We randomly split both the yearly wealth tax and the one-time wealth tax group into a treatment group (T_y or T_o) and a control group (C_y or C_o). In our treatment groups we inform our respondents about the effective tax burden of their proposed tax parameters. This enables us to reference treatment effects of both tax instruments against each other. Consequently, we end up with four random groups as presented in Figure 3.1.

In this study, we aim to identify to what extent stated preferences towards wealth taxation are biased by misperception due to (mathematical) complexity. Biased preferences could also arise from the fact that respondents do not even think about the total burden when entering the tax parameters (lack of awareness). However, our design specifically targets only lifetime accumulated wealth. By entering a tax rate with respect to the lifetime accumulated wealth, we can strongly assume that they relate it to a potential total tax burden.

Our information treatment is designed to provide sufficient information about the effective tax burden of the proposed tax parameters. Further, this information is presented in a way that our respondents should fully understand without any further effort. As shown in Figure 3.2, we present each effective tax burden that results from the preferred tax parameters both in a visual and in a written form. The visual information treatment is based on a responsive pie chart which immediately shows the effective tax burden and allows respondents to readjust their first entered tax parameters. Hovering over the pie shares, the absolute and relative effective tax burden as well as the remaining wealth (wealth net of taxes) are again interactively highlighted. With this comprehensive depiction of information we want to avoid any biases regarding metric or visual representation.

FIGURE 3.2: Main Survey Experiment.
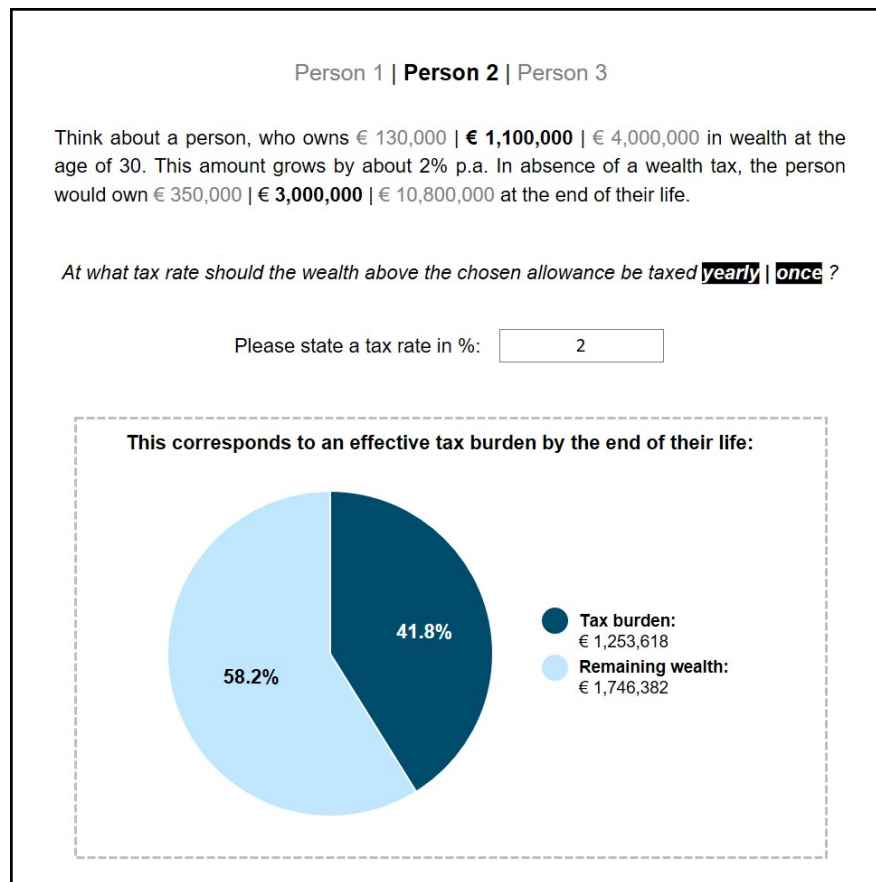
Note: This figure illustrates the main experiment: Grey font indicates the different hypothetical persons (within-subject); black background font indicates the different wealth tax instrument (between-subject); area framed in dashed grey line shows the information treatment (between-subject).

As shown in Figure 3.1, we included another experimental element (Part IV: "Choice & Reasoning") into our survey that takes place after the main part. We enrich our analysis on *informed* preferences by a within-subject comparison of both wealth tax instruments. Participants were asked to state their preference not only for their assigned tax instrument (yearly wealth tax or one-time wealth tax), but also in relation to the other tax instrument. Specifically, participants were shown the effective tax burden resulting from their tax parameter inputs in the previous part of the survey. We also informed respondents that both tax instruments lead to the same effective tax burden. To emphasize the different implementation of both tax instruments, the one-time wealth tax is presented as *one* amount to be paid, while the yearly wealth tax is presented as an average *yearly* amount to be paid.[9] Accordingly, participants could select one of the two wealth tax instruments or "no preference". Additionally, they were asked to include a written reason for their choice in an open-ended question format.

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[9] For simplicity, the average *yearly* amounts were calculated as the *one-time* amount divided by 50.

Even though not being part of our main study, this provides supportive evidence of how *informed* preferences differ across wealth tax instruments and first insights about the motives behind and beyond proposed tax rates.

3.4   Data

3.4.1   Data Collection

The survey experiment was conducted via the online access panel *Respondi*.[10] *Respondi* is a commercial survey company known primarily for market research or consumer product testing, but has recently been increasingly used for scientific research projects. Therefore, one might well assume that these panelists are less familiar with this type of research and more likely to provide answers that are consistent with their opinion rather than any strategic behavior (an advantage also exploited by Stantcheva, 2021).

Respondents were invited to participate in our survey by email. *Respondi* sent invitations to suitable panelists who lived in Germany, were at least 18 years old, and had varying monthly household net incomes. The invitation email only contained the duration of the survey. Only when clicking on the survey link, the participants received information about the research project. Participants could only take part with their PC, laptop or tablet, as access via smartphone was technologically prevented. On our consent page, respondents were advised to answer to the best of their knowledge and were assured that participation was entirely voluntary.

The use of online crowdsourcing platforms such as *Respondi* (or others, such as MTurk, clickworker, Prolific) is becoming increasingly prevalent for scientific purposes. The data are at least as reliable as those obtained using lab or field experiments, but require less money and time to collect (Horton, Rand, and Zeckhauser, 2011). There are also potential drawbacks we accounted for. First, panelists could participate in our survey even though they do not live in Germany. We used a third-party web service, IPHub, to screen out potential misuse of IP addresses.[11] Respondents using foreign IP addresses or virtual private networks (VPNs) were therefore screened out at the beginning of the survey. Second, panelists could participate multiple times. *Respondi* ruled this out by paying for participation only once. Further, we included attention checks and screened out every respondent who did not pass them.

3.4.2   Data Sample

The survey was conducted between December 15, 2020 and January 5, 2021.[12] After discarding inadmissible IPs or attention fails, we obtain an initial sample of N = 1,280 respondents.

Randomization into the four experimental groups worked well, although the number of respondents is not perfectly distributed. This is due to the fact that the attention check took

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[10] For further information, see `https://www.respondi.com/EN/` (07.06.2022).
[11] For further information, see `https://iphub.info/` (07.06.2022).
[12] Prior to the roll out of this survey, a pilot among business students was conducted at Humboldt University of Berlin in February 2019.

place after the assignment to the treatment groups. Table 3.1 shows that T_o (one-time wealth tax treatment group) is slightly over-sampled in both our initial sample and final sample.

As described in the previous chapter, we introduced several quality control measures and are able to use almost the entire initial data set for the analysis. We excluded only 31 respondents due to: (1) "Incomplete Tax Rates", i.e. at least one tax rate answer is missing, or (2) "Incoherent Tax Allowances", i.e. stated tax allowance seems to be arbitrary (e.g., € 111). The resulting Final Sample of 1,249 respondents can be seen in Table 3.1.

TABLE 3.1: Data Cleaning.

| | **Yearly Wealth Tax** | | **One-Time Wealth Tax** | |
	Control (C_y)	Treatment (T_y)	Control (C_o)	Treatment (T_o)
Initial Sample	312	306	311	351
Incomplete Tax Rates	1	4	5	5
Incoherent Tax Allowances	5	2	4	5
Final Sample	**306**	**300**	**302**	**341**

Note: This table shows data cleaning by group status. Respondents providing incomplete tax rates or incoherent allowances were screened out.

Responses that remain in the final sample are considered serious. The median duration for completing our survey is 11.4 minutes.[13]

The final sample is not representative of the German population in all characteristics. Table 3.2 shows the summary statistics of our final sample for each group. We additionally include summary statistics of the German population as a reference. These data are based on the 2018 wave of the General Social Survey in Germany (ALLBUS) provided by GESIS-Leibniz-Institut Für Sozialwissenschaften, 2019.[14] Comparison of our data with ALLBUS shows that our final sample is representative in terms of age and employment but less so in terms of gender, marital status, income, children, and education. On average, our participants have slightly higher incomes, are better educated, are less likely to be female and less likely to have children. Bold values in Table 3.2 indicate statistically significant differences from the German population ($p < 0.05$).

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[13] The minimum duration for completing our survey is 3.2 minutes. Since participants could pause the survey and continue it at a later time, the maximum duration is not meaningful.

[14] It is a biennial representative survey in Germany which is comparable to the General Social Survey (GSS) in the United States.

TABLE 3.2: Descriptive Statistics.

| | Yearly Wealth Tax | | One-Time Wealth Tax | | ALLBUS |
	Control	Treatment	Control	Treatment	2018
Age	52.1	51.4	51.9	52.0	51.2
Female	**0.34**	**0.42**	**0.39**	**0.38**	0.49
Married	0.52	**0.48**	**0.50**	0.53	0.58
Personal Income					
€0-€999	**0.11**	**0.11**	**0.14**	**0.15**	0.24
€1.000-€1.999	0.34	0.34	0.38	0.38	0.37
€2.000-€2.999	0.25	0.23	0.25	0.21	0.23
€3.000-€3.999	**0.17**	**0.19**	**0.15**	**0.20**	0.09
€4.000-€4.999	**0.08**	**0.08**	0.05	0.04	0.03
€5.000 and more	0.04	0.04	0.02	**0.01**	0.04
Children	0.65	**0.58**	**0.60**	**0.63**	0.69
University	**0.39**	**0.37**	**0.38**	**0.36**	0.20
Employed	0.59	0.67	0.60	0.61	0.62

Note: This table shows summary statistics in our four samples compared to the German General Social Survey (ALLBUS). The ALLBUS sample used here is the latest available wave of 2018. Survey weights at the personal level for Germany were used to determine the values. Statistically significant differences between our samples and the ALLBUS data are shown in bold ($p < 0.05$).

These few differences from the German population do not pose a problem for the internal validity of our experiment. However, we have to be cautious when making statements about the general attitude of Germans towards wealth taxation. Regarding internal validity, we need to check how well our randomization process worked. We verify this by running OLS regressions for each of the previously presented covariates in the form of $Group_i = \alpha + \beta \cdot Covariate_i + \epsilon_i$. The outcome variable $Group_i$ is a dummy variable that indicates the group status C_y, T_y, C_o and T_o respectively. This procedure results in 48 regression coefficients (4 groups x 12 covariates) shown in Table C.3 in Appendix. Out of these 48 estimated coefficients, only one coefficient is significant at the 5% level and only four are significant at the 10% level. If we regress $Group_i$ on all selected covariates, we get p-values for joint significance ranging from 0.12 to 0.89. Both results show covariates are not able to explain the experimental group status. Hence, we can conclude that the randomization process was successfull.

3.5   Results

The results are presented along our two hypotheses. In the first part, we present the results on whether and to what extent (mathematical) complexity affects stated preferences for wealth taxation. In the second part, we analyze how *informed* preferences differ across wealth tax instruments.

3.5.1 The Effect of (Mathematical) Complexity

3.5.1.1 Descriptive Analysis

Figure 3.3 provides an overview of our main results. The following graphs are based on proposed tax allowances and tax rates for all three scenarios. Hence, displayed effective tax burdens are based on the average values for the three different levels of wealth.

FIGURE 3.3: Baseline Results.
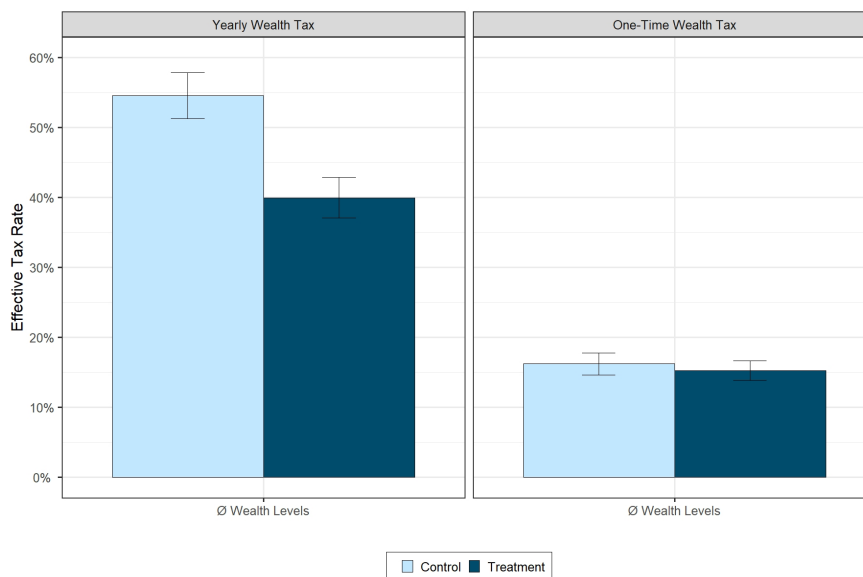
Note: The figure shows average effective tax rates by experimental group with 95% confidence bars.

While untreated respondents in the *yearly* wealth tax group intuitively propose, on average, an effective tax burden of about 55%, this number drops to about 40% in the informed (treated) group. Given the experimental design, this significant difference of almost 15 percentage points can be assigned to computational difficulties due to the complexity of the yearly wealth tax. In line with Hypothesis 1, our respondents seem to perceive an effective tax burden of 40% as "fair", but state tax parameters that lead to an effective tax rate of 55% because they misperceive the effective tax burden of a yearly wealth tax.

Following similar reasoning, we expect no significant treatment effect in case of the one-time wealth tax. This is because computing the effective tax burden given a tax allowance and a tax rate is rather easy and, hence, an accurate perception of the effective tax burden should be straightforward given basic calculational skills. Looking at effective tax rates in both one-time wealth tax groups shows that indeed no significant treatment effect can be identified. As outlined before, the non-existence of an effect in this setting also verifies that our information treatment does not create any distortions. Hence, this finding strengthens the validity of our results regarding the treatment effect in the yearly wealth tax groups.

The displayed effective tax rates are the result of combinations of entered tax parameters. Respondents first propose a general tax allowance and then tax rates for three hypothetical

individuals differing only in their accumulated wealth. All these tax parameters are entered on the same page. When respondents are informed about the tax consequences of the tax burden, they are allowed to adjust their initial thoughts about tax parameters. Although they can adjust both tax allowance and tax rates, they are more likely to adjust tax rates rather than tax allowance. Figure 3.4 shows the distribution of tax allowances by experimental groups.

FIGURE 3.4: Tax Allowances.
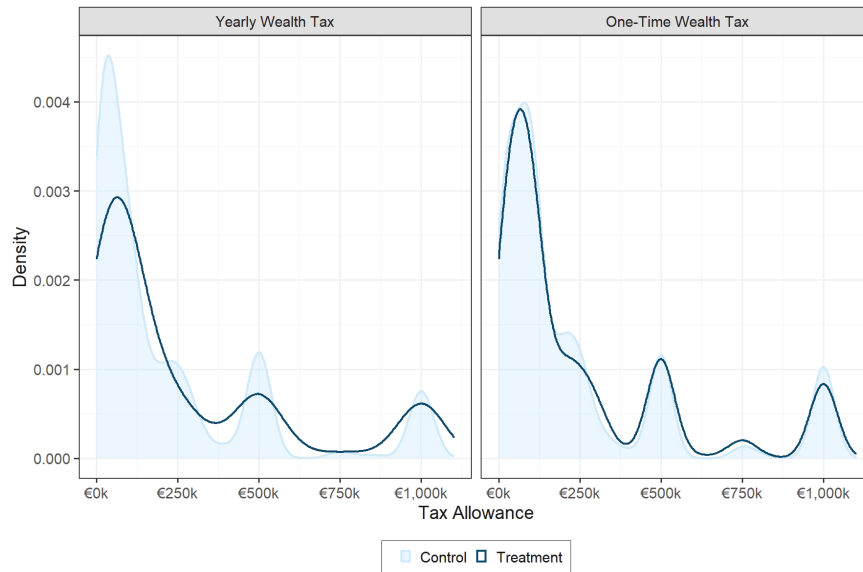
Note: Distribution of the inserted tax allowance by experimental groups. For presentation reasons, the figure does not include further observations for tax allowances above € 1,100,000.

The participants seem to have a clear idea of how much wealth should be exempt from wealth tax regardless of the wealth tax instrument. These preferred values are not significantly different between the four experimental groups (Welch One-Way ANOVA Test, p-Value = 0.66). Thus, the tax allowance is neither affected by the wealth tax instrument nor by the information treatment. The median tax allowance is € 100,000 in each group. The mean values (trimmed by 1%) are all in a similar range: € 463,347 (C_y) / € 411,075 (T_y) and € 353,558 (C_o) / € 341,988 (T_o). Only 0.5% of respondents prefer no tax allowance at all and about 0.6% of respondents reject any wealth tax with a proposed tax allowance exceeding the maximum accumulated wealth.

After entering a general tax allowance participants were asked to state their preferred nominal tax rate for each of three hypothetical persons differing in their accumulated wealth (€ 350,000, € 3,000,000, and € 10,800,000). Figure 3.5 shows the distribution of tax rates by experimental group and wealth level.

FIGURE 3.5: Nominal Tax Rates.
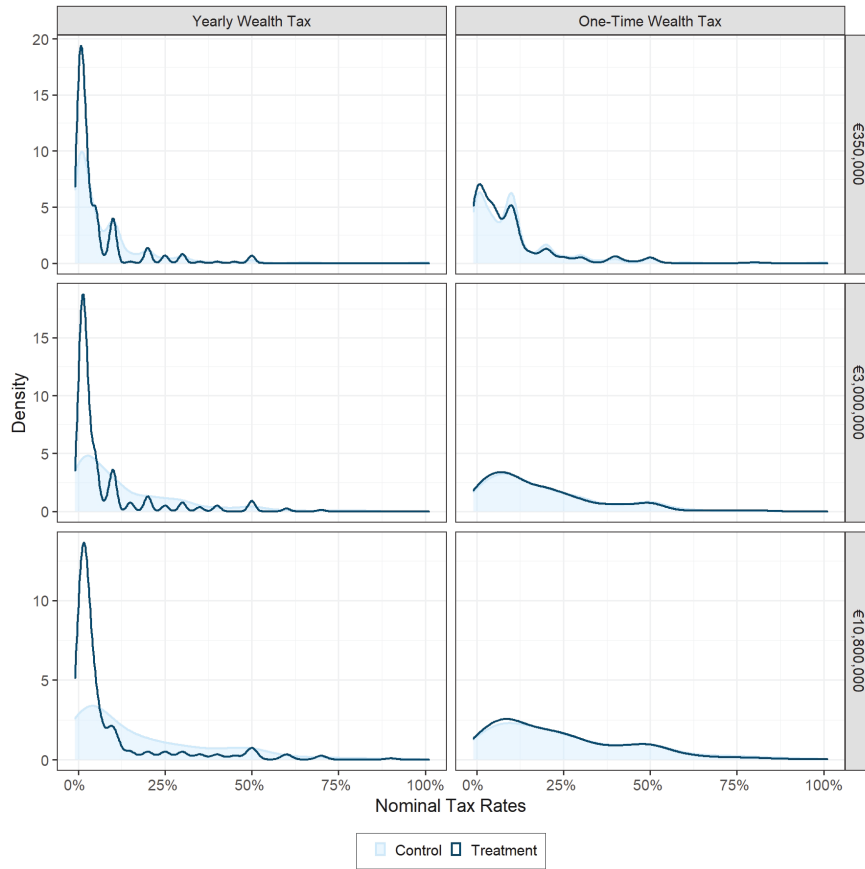
Note: Distribution of the inserted nominal tax rates by different wealth levels and experimental groups. Nominal tax rates cannot be compared between wealth tax instruments.

While the distribution of nominal tax rates in the one-time wealth tax group is not distinguishable between control and treatment group, the tax rates in the yearly wealth tax group are shifted to lower values in the treatment group. For example, looking at the mean (median) values of the tax rate for scenario 3 (accumulated wealth of € 10,800,000), we see large differences for the yearly wealth tax: 0.181 (0.100) in C_y and 0.090 (0.020) in T_y, but hardly any differences for the one-time wealth tax: 0.255 (0.200) in C_o and 0.238 (0.200) in T_o. The information treatment on the effective tax burden leads to strong tax rate adjustments only in the yearly wealth tax group. These nominal tax rate adjustments translate into changes of effective tax rates (see Figure 3.3).

3.5.1.2 Regression Analysis

The baseline results on effective tax rates shown in Figure 3.3 are confirmed by regression analysis which takes the following simplified form:

$$
\begin{aligned}
ETR_{i,j} = \alpha + {} & \beta_1 \cdot Yearly\ Wealth\ Tax_i + \beta_2 \cdot Info\ Treatment_i + \\
& \beta_3 \cdot Yearly\ Wealth\ Tax_i \times Info\ Treatment_i + \\
& \beta_4 \cdot Wealth\ Levels_j + \beta_n \cdot X_i + \epsilon_{i,j} + u_i
\end{aligned}
\tag{3.6}
$$

$ETR_{i,j}$ is the derived effective tax rate of respondent i for j different scenarios (see Section 3.2.1 for derivation). The variable *Yearly Wealth Tax$_i$* indicates the wealth tax instrument, *Info Treatment$_i$* indicates the treatment group status, *Wealth Levels$_j$* indicates the j different scenarios and X_i is a vector of individual controls.

We run a random effects panel model as well es a Tobit random effects panel model to account for censored data in case of rejecting wealth taxation.[15] Results are displayed in Table 3.3.

TABLE 3.3: Regression Results.

	Effective Tax Rate			
	Random Effects Model		*Tobit Model*	
	(1)	(2)	(3)	(4)
Constant	0.023***	−0.161***	−0.027	−0.233***
	(0.008)	(0.053)	(0.021)	(0.069)
Info Treatment	−0.010	−0.001	−0.011	−0.002
	(0.011)	(0.010)	(0.028)	(0.027)
Yearly Wealth Tax	0.384***	0.393***	0.391***	0.400***
	(0.018)	(0.017)	(0.024)	(0.024)
Info Treatment x Yearly Wealth Tax	−0.137***	−0.145***	−0.135***	−0.145***
	(0.025)	(0.024)	(0.032)	(0.032)
€ 3,000,000	0.171***	0.172***	0.211***	0.213***
	(0.005)	(0.005)	(0.009)	(0.009)
€ 10,800,000	0.245***	0.246***	0.289***	0.290***
	(0.006)	(0.007)	(0.006)	(0.006)
Controls	✗	✓	✗	✓
Observations	3,747	3,696	3,747	3,696
Adjusted R^2	0.466	0.480		
Log Likelihood			369.622	431.860

Note: This table presents the regression results from random effects estimations (columns (1) and (2)) and Tobit estimations (columns (3) and (4)) using the dependent variable effective tax rate. Reduced version of Table C.4. The wealth level effects are relative to the € 350,000 level. Controls include Age, Female, Inheritance Tax, Future Tax, Past Tax, Left Parties, Redistribute, Inequality, Children, University, High Income, Employment and Control. Variables are defined in Table C.1. Robust standard errors clustered at the respondent level. Standard errors in parentheses: $^{*}p < 0.1$, $^{**}p < 0.05$ and $^{***}p < 0.01$.

Primarily, we are interested in the treatment effect for both wealth tax instruments. The information effect for the one-time wealth tax is given by the coefficient "Info Treatment" and for the yearly wealth tax by the sum of the coefficients "Info Treatment" and "Yearly

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[15] Of our 3,747 observations, 467 (12.5%) have an effective tax rate of 0%. These are cases where either the entered tax rate is 0% or the tax allowance is larger than the taxable wealth.

Wealth Tax × Info Treatment". In each case, we obtain the average treatment effects across all three wealth levels.[16] We find the treatment has a large and statistically significant negative effect on the effective tax rate in the *yearly* wealth tax group, while it has no effect in the *one-time* wealth tax group. This is true for both specifications, i.e., even when all observable characteristics are included in the regression analysis. The treatment effect is very similar in terms of magnitude and statistical significance in both settings.

Although the information treatment reduces the mean effective tax burden of the yearly wealth tax by almost 15 percentage points, there remains a considerable difference in the effective tax burdens of almost 25 percentage points between the two wealth tax instruments. We interpret this difference in terms of existing differences in *informed* preferences between both tax instruments: People prefer much higher effective tax burdens in case of a yearly wealth tax compared to a one-time wealth tax (40.0% vs. 15.2%).

Regarding potential heterogeneity of the treatment effect we examine whether the treatment effect daiffers across subgroups. Some groups of participants might respond less to additional information because they already understand the mechanism of a wealth tax and others might ignore it completely. To test for potential heterogeneity, we extend the regression analysis for the yearly wealth tax groups by adding interaction terms in the form of Covariate × Info-Treatment (see Table C.5 in the Appendix). In general, we find little evidence of heterogeneity in our treatment effect. However, knowledge about the existing wealth taxation in Germany (i.e. inheritance tax) seems to be a moderating factor. We ask participants for their best guess on what share of the German population is affected by the existing inheritance tax. We argue that respondents closer to the actual share are better informed about wealth taxation and wealth distribution in Germany. Reported shares below 10% indicate a good understanding of the current inheritance tax system since this number approximately represents the true share of the affected German population.[17]

On average, our respondents estimate 29.2% of the German population to be affected by the inheritance tax. Only 13.7% indicate an approximately accurate share of less than 10%. In comparison, only 5.9% of our respondents state they have already paid inheritance tax themselves. According to our calculations, this figure is in the same order of magnitude as the actual proportion of people affected in Germany.

We find that respondents with better knowledge about inheritance taxation in Germany respond significantly less to the information treatment. That is, even without information treatment, they have less biased perceptions of the effects of their entered tax parameters (see Table C.5 in Appendix).

In sum, informing our respondents does have a strong effect in the *yearly* wealth tax group but does not significantly change the proposed effective tax burden in the *one-time* wealth

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[16] For presentation reasons, we show no output regarding treatment effects for each level of wealth. The treatment effects are somewhat stronger for the two higher wealth levels, which is due to the fact that the higher rejection rate of wealth taxes on € 350,000 is not affected by the information treatment.

[17] It is difficult to determine this number accurately. Our determination of this number is outlined in Appendix C.3.1.

tax group. We conclude that our information treatment succeeds to reveal misperceptions in the *yearly* wealth tax group.

3.5.2   Informed Preferences for Wealth Taxation

People proposing much higher effective tax rates in case of a yearly wealth tax compared to a one-time wealth tax does not necessarily mean that they prefer a yearly wealth tax over a one-time wealth tax. Nevertheless, we can support this interpretation by a within-subject question after the main part of our survey. In contrast to previous parts of the survey with only a single type of tax, our respondents in this setting face more options: the one-time wealth tax of €X, the yearly wealth tax with an average of €X per year, or no preference (see Section 3.3). The effective tax burdens of both wealth tax instruments are based on their tax parameter inputs in the previous part of the survey (i.e. stated tax parameters for the scenario with a final wealth level of €10,800,00). Further, they are informed that the effective tax burden is equal for both tax instruments and all participants are provided with sufficient information about the tax burden consequences.

Respondents clearly indicate a preference for a yearly wealth tax. Overall, 68.4% of respondents opt for the yearly wealth tax, 19.4% for the one-time wealth tax and 12.2% are indifferent. In Figure 3.6, we display the shares of the preferred tax system by groups.

FIGURE 3.6: Within-Choice.
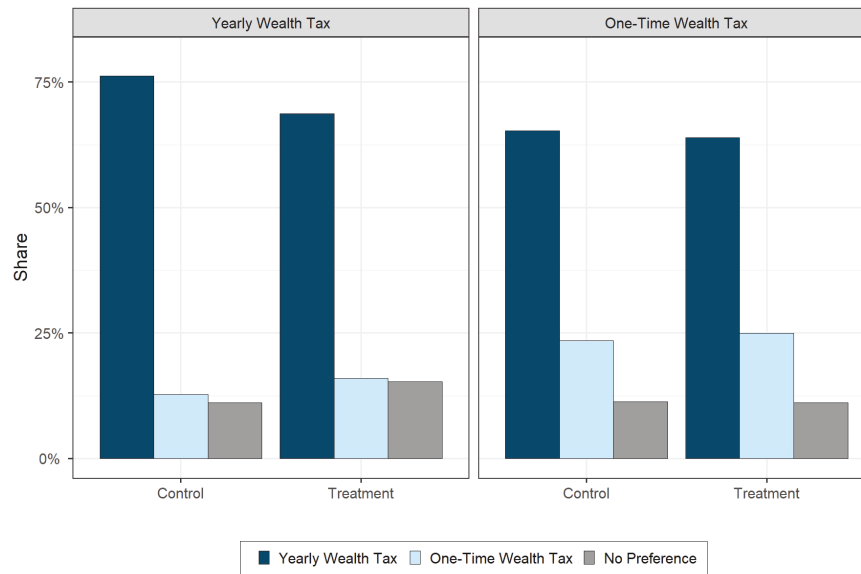
Note: Average shares of chosen wealth tax instrument by experimental groups.

The vast majority of our participants opt for the yearly wealth tax in each experimental group. Thus, this reinforces our finding that higher preferred effective tax burdens for a yearly wealth tax is a direct expression of it being the preferred tax instrument. We additionally run a logistic regression to explain the choice between a yearly wealth tax and a one-time wealth tax instrument. Table 3.4 shows the regressions results.

TABLE 3.4: Logistic Regression Results.

	Choice: Yearly Wealth Tax			
	(1)	(2)	(3)	(4)
Constant	1.021***	−1.370*	0.673***	−1.289*
	(0.138)	(0.709)	(0.157)	(0.713)
Info Treatment	−0.079	−0.026	−0.062	−0.035
	(0.188)	(0.196)	(0.190)	(0.196)
Yearly Wealth Tax	0.767***	0.863***	0.158	0.407
	(0.222)	(0.230)	(0.255)	(0.272)
Yearly Wealth Tax × Info Treatment	−0.252	−0.382	0.0004	−0.182
	(0.302)	(0.314)	(0.309)	(0.322)
Effective Tax Burden			0.136***	0.097***
			(0.030)	(0.032)
Controls	✗	✓	✗	✓
Observations	1,097	1,082	1,097	1,082
Log Likelihood	−569.689	−537.574	−558.853	−532.945

Note: This table presents the regression results from logistic estimations using the dependent variable choice (yearly wealth tax = 1, one-time wealth tax = 0). Respondents who do not have a preference are excluded. Reduced version of Table C.6. Controls include Age, Female, Inheritance Tax, Future Tax, Past Tax, Left Parties, Redistribute, Inequality, Children, University, High Income, Employment and Control. Variables are defined in Table C.1. Standard errors in parentheses: $^*p < 0.1$, $^{**}p < 0.05$ and $^{***}p < 0.01$.

In specifications (1) and (2), we check whether the experimental group is associated with a higher probability to choose the yearly wealth tax. As already indicated in Figure 3.6, there are no differences depending on whether participants were already informed in the main part of the experiment. Hence, we can assume that the provided information is sufficient. But respondents facing the yearly wealth tax in the previous part are more likely to opt for the yearly wealth tax (i.e. status quo bias).

When additionally controlling for the displayed effective tax burden[18] in specifications (3) and (4) the status quo bias disappears. Instead, the displayed effective tax burden increases the probability of choosing the yearly wealth tax. Although the ratio of the two displayed monetary amounts is always constant at 1:50 (yearly:one-time wealth tax), the desire to split the tax over time increases as the monetary amount increases.

The decision for or against a specific wealth tax instrument could also be influenced by personal interests. Since the age of the participants, their income and also their expectation to be affected by the inheritance tax do not play a role, we assume that these interests have only a minor influence on the answers regarding hypothetical persons. Only higher redistributive

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[18] The displayed effective tax burdens are customized based on tax parameter inputs in the previous part of experiment (i.e. stated tax parameters for the scenario with a final wealth level of € 10,800,000).

preferences and being employed are significantly positively associated with the likelihood of choosing the yearly wealth tax (see Table C.6).

We further ask our respondents to briefly explain their choice in an open-ended survey question. This helps us to understand the underlying motives for choosing one wealth tax instrument over the other. With a 99.2% response rate and an average length of 14 words,[19] our respondents seem to take the task quite seriously.

Since these answers can often only be interpreted in the context of the choice made before, we decided to manually classify the answers into topics. For this purpose, we analyzed the first 100 responses to this question and find 12 distinct topics mentioned by the participants. We then considered the remaining responses and sorted these into one or more of the 12 topics. 18.9% referred to two or more topics and 25.4% of the participants either give no answer or their answer cannot be assigned to any of the topics. The frequency of reasons per chosen wealth tax instrument is displayed in Figure 3.7.

FIGURE 3.7: Reasons for Within-Choice.
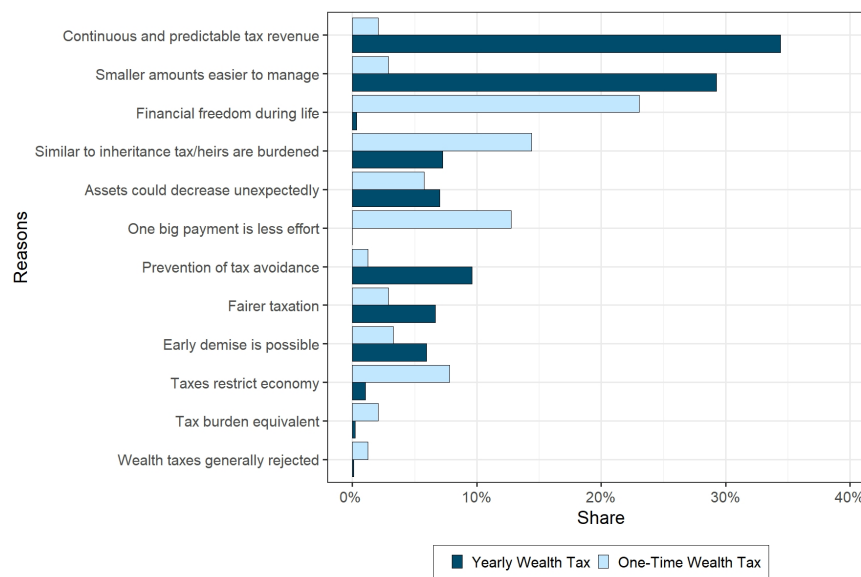
Note: Frequency of manually classified topics by chosen wealth tax instrument. Respondents can mention more than one topic within their response.

The preference for a yearly wealth tax is explained primarily by the desire for continuous and predictable tax revenues (34.4%) and by the preference for smaller payments that are easier to manage (29.3%) (Kelly, 2012; Yaniv, 1999). In addition, the yearly wealth tax is seen as less prone to tax avoidance and more fair (Yaniv, 1999). In contrast, the choice in favor of a one-time wealth tax is mainly justified by economic and financial freedom during lifetime (23.0%) and by the effective transfer of the tax burden to the heirs (14.4%). Moreover, processing one single large amount is also considered less burdensome. In line

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[19]   The mean length differs considerably among preferred taxes: preferences for a one-time wealth tax: 17.83 words, preferences for a yearly wealth tax: 12.78 words and no preference: 10.74 words.

with Capellen, Halland, and Tungodden (2019) and Stantcheva (2021) efficiency concerns of respondents play a minor role.

In sum, remaining differences in *informed* preferences across wealth tax instruments in terms of effective tax rates prevail when people are directly choosing the wealth tax instrument.

3.6   Discussion & Conclusion

Comparing the effective tax burdens based on proposed tax parameters in case of a yearly wealth tax and a one-time wealth tax, we find a large and significant difference. Our research design enables us to explain part of this difference explicitly by bounded rationality: While the total difference between preferences for both taxes in the untreated groups amounts to about 39 percentage points (yearly wealth tax about 55%; one-time wealth about 16%), a share of about 15 percentage points of this difference can be assigned to computational issues. Hence, our respondents clearly underestimate the tax burden consequences of the yearly wealth tax. Informing respondents about these consequences barely changes the preferred effective tax rate in the one-time wealth tax, but decreases the effective tax burden in the yearly wealth tax by about 15 percentage points. Therefore, almost 40% of the difference can be explained by misperceived consequences of yearly wealth tax rates.

However, this effect may be biased due to three reasons: First, we neglect any "second round effects" of the yearly wealth tax, i.e. we only consider the direct tax burden and assume that our hypothetical persons do not change to their savings plans. Thus, our research design may underestimate the actual burden induced by the tax. As a result, our information treatment, which is calculated based on these assumptions, also underestimates our treatment effect. Second, our respondents might be subject to a *round number bias* and are reluctant to enter sufficiently differentiated decimal places in their proposed tax rates. Consequently, they are less likely to adjust their tax parameters infinitely until they get their exact preferred effective tax burden. Such an effect would bias responses in both directions. A further analysis in our Appendix C.3.2, however, clearly indicates that this issue can at least (partially) be resolved in the treatment group: a significant share of answers shifted from round numbers to numbers including decimals. Third, our design does not provide any additional incentives for respondents to react to our information treatment. Especially due to this latter point, we assume that we rather underestimate the treatment effect.

After resolving computational issues, a large and significant difference (more than 60% of the total difference) remains. Indeed, this trend is supported by our additional within-question: Respondents - independent of the experimental group - clearly prefer a yearly wealth tax over a one-time wealth tax. In line with findings of other disciplines (see e.g., Della Vigna and Malmendier, 2006; Iyengar et al., 2011), we reason that people accept higher total payments if they are split into (several) smaller ones. This finding also supports the findings of Blesse, Buhlmann, and Dörrenberg, 2020 who show that individuals are actually willing to accept some degree of complexity if normative preferences (here: the demand for smaller installments) preponderate.

Yet, it is important to emphasize how our experiment builds on the strong assumption of the comparability between a yearly and a one-time wealth tax. Whereas this does not affect the strong internal validity of our results with respect to the documentation of the significant computational deficiencies (cf. our first hypothesis), the interpretation of the "informed preferences" strongly favoring a periodic wealth tax (cf. our second hypothesis) is potentially affected by different beliefs on, e.g., purpose of tax revenues or entitlement of the taxpayer. Our research design attempts to address these concerns as far as possible: It purposely refrains from inducing beliefs on public spending with abstract wording only considering a single generation. While this level of abstraction is in line with a growing body of literature using such methods to elicit normative preferences for taxation,[20] we are not able to completely cancel out these concerns. Nonetheless, we believe to provide an important piece to the picture of preference formation of wealth taxation.

Lastly, one could argue that uncertainty about legislative changes in the future affects preferences regarding different types of wealth taxation. E.g., in case of a one-off tax which is levied at an age of 80, a 30-year-old taxpayer would not be affected if it was repealed over the next 49 years. Obviously, the legislator could also increase or decrease the respective tax in this period of time. This issue is not of concern for our results. By design, we put our respondents into the role of implementing their personally preferred tax policy for the proposed period of time. They choose their preferred parameters of a certain type of wealth tax rather than evaluate whether they propose a certain type of wealth tax under uncertainty.

Taken together, we argue that preferences for tax parameters of wealth taxation are driven by three main factors: First, preferences depend on how these parameters translate into the total effective tax burden. Second, preferences depend on whether the single tax payments seem reasonable or feasible for the taxpayer. Third, although preferences for round numbers are especially pronounced, and thus biased in an experimental setting, we do not think of this as a mere experimental phenomenon. We rather claim that "true" preferences for round numbers also exist "in reality". Especially in case of the yearly wealth tax, the latter two factors may complement each other leading to effective tax burdens that are higher than the preferred tax burden of a one-time wealth tax.[21]

The key conclusions that can be drawn from our results are twofold and tie in with our two hypotheses: First, (mathematical) complexity exists in case of the yearly wealth tax,[22] but can (at least partially) be resolved by the provision of information about tax burden consequences. These insights yield the unsurprising, yet fairly important implication of how a public discourse should be administered in face of complex reforms like taxation. Easily accessible but comprehensive information is key to form qualified voting preferences. The

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[20] See e.g., Weinzierl, 2014, Weinzierl, 2017 and Fisman et al., 2020.

[21] This can explain why Chirvi and Schneider, 2019 come to an apparently conflicting finding as they focus on the first factor of preferences (total tax burden) and abstract from preferences towards tax parameters that are the center of tax reform discussions.

[22] Among other things, participants referred to mathematical complexity when asked for general comments about the survey, such as, "Content: interesting topic; I have no idea if I'm anywhere near as fair with my percentages as I'd like to be. This is incredibly difficult for a layperson to answer", "This required mental arithmetic", or "The wealth tax calculation was too difficult for me."

risk of misleading or unintended policies is apparent - just as apparent as the potential exploitation of these misperceptions by asymmetrically better informed societal players like lobbyists and policy makers. Second, we find a prevailing preference for a yearly wealth tax after resolving misperceived effective tax burden consequences. Whereas we believe this preference corresponds to a somehow more intended, actually *informed* preference we can not fully factor in other potentially important behavioral biases. It is up to further research to explore how such biases (e.g., timely preferences as hyperbolic discounting or concentration bias; or round number bias) or specific heuristics translate into preferences towards tax instruments.

4 Steuerbelastung deutscher Kapitalgesellschaften von lediglich 20 % - Fakt oder Fake News?

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Abstract

Eine von Die Grünen/EFA in Auftrag gegebene Studie kommt basierend auf handelsrechtlichen Einzelabschlüssen zum Ergebnis, deutsche Kapitalgesellschaften würden durch erfolgreiche Steuergestaltungen lediglich rund 20 % anstelle der gesetzlich geforderten 30 % an Steuern zahlen. Diese Behauptung hält einer wissenschaftlichen Überprüfung ebenso wenig stand wie die Aussage, große und international agierende Unternehmen hätten eine niedrigere Steuerquote. Wenn bei der Sample-Selection berücksichtigt wird, dass die verwendeten (Handels-)Bilanz-Datenbanken auch Personenunternehmen sowie ganz oder teilweise steuerbefreite Unternehmen beinhalten, und der (95%ige) Steuerfreistellung von (Schachtel-) Dividenden gemäß § 8b KStG Rechnung getragen wird, ergibt sich eine durchschnittliche Steuerbelastung deutscher Kapitalgesellschaften unabhängig von deren Größe und Internationalität im Bereich des gesetzlichen Nominalsteuersatzes. Jedoch ist darauf hinzuweisen, dass dieses Ergebnis nicht bedeutet, dass es keinerlei Steuergestaltungen zu Lasten des deutschen Fiskus gibt. Nur lassen sich derartige Steuergestaltungen nicht anhand von unternehmerischen Einzelabschlüssen identifizieren.

4.1   Einleitung

Am 22.01.2019 wurde die Studie „Effective Tax Rates of Multinational Enterprises in the EU" (Janský, 2019)[1] veröffentlicht, welche von der Fraktion Die Grünen/Europäische Freie Allianz im Europäischen Parlament (nachfolgend Grüne/EFA) in Auftrag gegeben wurde. Die Ergebnisse der Studie stießen auf ein großes Medienecho und wurden nahezu einhellig dahingehend interpretiert, dass große multinationale Unternehmen zu wenig Steuern entrichten[2] und am stärksten vom „Steuerdumping" profitieren.[3] Für in Deutschland tätige Unternehmen, genauer Kapitalgesellschaften, wurde eine gewichtete durchschnittliche Steuerbelastung (Effective Tax Rate (ETR)) von rund 20 % (genauer Wert: 19,6 %) ermittelt, die nahezu 10 Prozentpunkte und damit rund ein Drittel unter dem in der Studie als Referenzwert herangezogenen Nominalsteuersatz i.H.v. 29,5 % liegt.[4]

Welche Steuervermeidungsstrategien von den Unternehmen genau genutzt werden, um die Steuerbelastung so gravierend zu drücken, wird nicht erklärt. Es werden lediglich Schlagwörter wie „tax rulings", „tax holidays" und „other tax provisions" genannt und geschlussfolgert, deretwegen sei nichts anderes als eine unangemessen niedrige Besteuerung zu erwarten. „ETRs are, as expected, lower than nominal rates in most countries. This is natural given the tax holiday and other tax provisions that make the ETRs lower than nominal rates" (Janský, 2019, S. 15).

Gerade für Deutschland, das weder „tax rulings" noch „tax holidays" kennt, und dessen „other tax provisions" oftmals eher steuererhöhend denn steuermindernd wirken (z.B. Zins- und Lizenzschranke), ist es doch verwunderlich, dass die ETR deutscher Unternehmen den Nominal¬steuersatz im Durchschnitt um nahezu ein Drittel unterschreitet. Die einzigen Erklärungsansätze hierfür können entweder internationale Steuergestaltungen sein, was auch die von der Studie und den Grünen monierte Benachteiligung lokal tätiger Unternehmen erklären würde, oder methodische Unzulänglichkeiten der Studie. Letztere sind Gegenstand des vorliegenden Beitrags, der zeigt, dass die ETRs deutscher Kapitalgesellschaften bei einer adäquaten methodischen Herangehensweise nur unwesentlich vom Nominalsteuersatz abweichen. Ob diese Erkenntnis Eingang in die politische und öffentliche Diskussion finden wird, bleibt abzuwarten. Schließlich lassen sich „Erkenntnisse" wie „die Unternehmen zahlen zu wenig Steuern" besser vermarkten bzw. für die eigene politische Agenda nutzen.[5]

Das Vorgehen im vorliegenden Beitrag ist wie folgt. Zunächst werden die Ergebnisse von Janský (2019) repliziert. Darauf aufbauend wird eine eigenständige Analyse durchgeführt, in der die methodischen Schwächen von Janský (2019) adressiert und ausgeräumt werden.

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[1] Die Studie wurde von Pertr Janský, Universität Prag durchgeführt.

[2] Vgl. z.B. Süddeutsche Zeitung (2019a) und Spiegel Online (2019).

[3] So Sven Giegold, wirtschafts- und finanzpolitischer Sprecher der Grünen/EFA-Fraktion, in einer Pressemitteilung der Grünen vom 22.01.2019 zu der oben genannten Studie.

[4] Auch Markle und Shackelford, 2009; Markle und Shackelford, 2012 kommen zu effektiven Steuersätzen deutscher Unternehmer, die deutlich unter dem Nominalsteuersatz liegen.

[5] In der Studie wird dazu ausgeführt: "ETRs are, as expected, lower than nominal rates in most countries. This is natural given the tax holiday and other tax provisions that make the ETRs lower than nominal rates" (Janský, 2019, S. 15).

Dabei wird unter anderem herausgearbeitet, welchen Einfluss die Stichprobenauswahl und die Berücksichtigung der Steuerfreistellung von Dividenden gemäß § 8b KStG auf die gewonnenen Ergebnisse haben. Auch wird gezeigt, wie unternehmensspezifische Nominalsteuersätze, ein Abstellen auf die laufenden Steuern oder ein längerer Betrachtungszeitraum sich auf die Resultate auswirken. Schließlich werden die Behauptungen, dass vor allem große und multinationale Unternehmen besonders niedrige Steuerbelastungen aufweisen, überprüft. Der Beitrag endet mit einer Zusammenfassung der wichtigsten Ergebnisse.

4.2 Einordnung der Ergebnisse der Grüne/EFA-Studie in die Literatur

In Deutschland haben das Leibniz-Zentrum für Europäische Wirtschaftsforschung (ZEW) und das Institut der deutschen Wirtschaft (IW) jeweils eine Stellungnahme zu der Grüne/EFA-Studie abgegeben. Bräutigam, Ludwig und Spengel (2019) vom ZEW begründen ihre Kritik an der Studie bezogen auf deutsche Unternehmen hauptsächlich mit der fehlenden Berücksichtigung von gem. § 8b KStG steuerfrei gestellten Dividenden und dem Abstellen auf eine gewichtete ETR. Hentze (2019) vom IW führt als Gründe für die behauptete Abweichung zwischen ETR und Nominalsteuersatz ebenfalls die Dividendenfreistellung (allerdings verweist er nur auf Auslandsdividenden) sowie steuerliche Verlustvorträge an. In seiner Analyse der ETRs für ein restriktiveres Sample von 4.832 deutschen Kapitalgesellschaften[6] aus der Dafne Datenbank[7] ermittelt er für den Zeitraum von 2009 bis 2017 eine gewichtete ETR i.H.v. 28 % und damit eine Belastung in der Nähe des Nominalsteuersatzes. Jedoch ist der Beitrag von Hentze sehr kurz und lässt viele Fragen offen. So bleibt der Effekt der Sample-Selection auf die Ergebnisse ebenso unklar wie die Berücksichtigung steuerfreier Dividendenerträge, die unter den § 8b KStG fallen.

ETRs spielen in der *Tax Agressiveness* Literatur eine wichtige Rolle. Eine relativ niedrige unternehmensindividuelle ETR – insbesondere auf Konzernebene – wird als ein Indikator für Steuergestaltungen des betreffenden Unternehmens angesehen.[8] In diesem Literaturstrang stehen neben der deskriptiven Analyse effektiver Steuerquoten die Einflussfaktoren auf die unternehmerische ETR im Fokus.[9]

Im Zusammenhang mit der Unternehmensgröße, die in der Grüne/EFA-Studie als ein Faktor mit negativem Einfluss auf die ETR genannt wird,[10] sind die empirischen Ergebnisse uneinheitlich. Einen derartigen, negativen Zusammenhang gibt es nach Porcano (1986) für

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[6] Die restriktive Stichprobenauswahl führt im Vergleich zur Studie von Janský (2019) zu einem nur halb so großen Datensatz. Hentze analysiert lediglich Kapitalgesellschaften, die für alle Jahre im Zeitraum 2009 bis 2016 positive Werte für den Jahresüberschuss und die Ertragsteuern ausweisen und bei denen die jährlichen Ertragsteuern den Vorsteuergewinn nicht übersteigen (vgl. Hentze, 2019, S. 3).

[7] Dafne ist eine kommerzielle Datenbank mit Firmen- und Finanzdaten für Deutschland.

[8] Vgl. u.a. Hanlon und Heitzman (2010, Table 1).

[9] Vgl. dazu u.a. (Gupta und Newberry, 1997; Janssen und Buijink, 2000; Kraft, 2014; Porcano, 1986; Richardson und Lanis, 2007; Zimmerman, 1983).

[10] Die Unternehmen werden dafür in drei Größenklassen eingeteilt und anschließend anhand ihrer durchschnittlichen gewichteten ETR verglichen; die der großen Unternehmen ist entsprechend kleiner (vgl. Abschnitt 4.5.1).

US-amerikanische sowie nach Richardson und Lanis (2007) für australische Konzerne.[11] Dagegen finden Zimmerman (1983) und Rego (2003) höhere effektive Konzernsteuerquoten für große US-Unternehmen.[12] Gupta und Newberry (1997) wiederum identifizieren für US-Unternehmen keinen eindeutigen Zusammenhang zwischen Unternehmensgröße und Konzernsteuerquote.[13] Für Deutschland konstatiert Kraft (2014) einen schwachen positiven Zusammenhang zwischen Unternehmensgröße und Konzernsteuerquote,[14] während nach Gebhardt und Siemers (2017) mittelgroße Unternehmen stärker belastet werden als kleine oder große Unternehmen.[15]

Neben der Unternehmensgröße suggeriert die Grüne/EFA-Studie auch, dass die Auslandsaktivität eines Unternehmens einen negativen Einfluss auf die unternehmerische Steuerbelastung hat. Die empirische Evidenz ist auch hier gemischt. Nach Rego (2003) besteht für US-Konzerne und nach Kraft (2014) für deutsche Konzerne ein negativer Zusammenhang zwischen Auslandsaktivität und ETR.[16] Hingegen finden Janssen und Buijink (2000) für niederländische Unternehmen, Sureth, Halberstadt und Bischoff (2009) für deutsche börsennotierte Aktiengesellschaften sowie Markle und Shackelford (2009) und Markle und Shackelford (2012) für ein internationales Sample keinen Unterschied zwischen ETRs international agierender und national tätiger Unternehmen.[17] Für die deutschen Unternehmen in ihrem Sample finden Markle und Shackelford (2009) und Markle und Shackelford (2012), dass international agierend Unternehmen sogar tendenziell eine höhere Steuerquote ausweisen, wenngleich dies nicht immer statistisch signifikant ist.[18]

Eine aktuelle und adäquate Analyse der ETRs deutscher Unternehmen, genauer: Kapitalgesellschaften, ist Inhalt des vorliegenden Beitrags. Wir zeigen die Notwendigkeit einer sachgerechten Sample-Selection auf und demonstrieren, dass eine methodisch fundierte Analyse der ETRs deutscher Kapitalgesellschaften gänzlich andere Ergebnisse hervorbringt als eine durchschnittliche ETR i.H.v. 19,6 %.

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[11]   Vgl. Porcano (1986, S. 23) und Richardson und Lanis (2007, S. 699).

[12]   Siehe dazu Zimmerman (1983, S. 124) und Rego (2003, S. 820f.).

[13]   Vgl. Gupta und Newberry (1997).

[14]   Vgl. Kraft (2014, Table 5, S. 12).

[15]   Vgl. Gebhardt und Siemers (2017, S. 22). Überraschenderweise befinden sich in ihrem Sample viele Unternehmen mit einer ETR von 0 %, was die Autoren des Beitrags auf Firmenneugründungen und Steueroptimierungsstrategien internationaler Unternehmen zurückführen. Begründet wird diese Vermutung jedoch nicht. Es ist u.E. vielmehr davon auszugehen, dass es sich um gemeinnützige und damit steuerbefreite Unternehmen handelt (s. dazu Abschnitt 4.4.1).

[16]   Vgl. Rego (2003, S. 820f.) und Kraft (2014, S. 12).

[17]   Vgl. Janssen und Buijink (2000, Table 6-9); Sureth, Halberstadt und Bischoff (2009, S. 56f.); Markle und Shackelford (2009, S. 8); Markle und Shackelford (2012, S. 494).

[18]   Vgl. Markle und Shackelford (2009) und Markle und Shackelford (2012, Table 2).

4.3 Replikation der Grüne/EFA-Studie für deutsche Kapitalgesellschaften

4.3.1 Methodik

In der Literatur gibt es eine Vielzahl von Ansätzen, die effektive Steuerbelastung (ETR) zu ermitteln.[19] Janský (2019) verwendet in der Grüne/EFA-Studie die sog. GAAP-ETR. Diese wird dadurch ermittelt, dass der Gesamtsteueraufwand (= laufender Steueraufwand + latente Steuern) ins Verhältnis zu einem handelsrechtlichen Jahresergebnis vor Steuern gesetzt wird.[20] Zudem berechnet er gewichtete (durchschnittliche) ETRs,[21] indem der Gesamtsteueraufwand sämtlicher Unternehmen aufaddiert und durch die Summe der Jahresüberschüsse vor Steuern dividiert. Dies führt zum selben Ergebnis wie eine Gewichtung der ETR eines jeden Unternehmens mit dessen Jahresergebnis vor Steuern. Dieser gewichtete Durchschnitt ist gleichbedeutend mit der Steuerquote der betrachteten Unternehmen.[22]

Die im vorliegenden Fall interessierende gewichtete ETR deutscher Unternehmen errechnet sich damit wie folgt:

$$ETR_{gewichtet} = \frac{\sum_{t=1}^{T} \sum_{i=1}^{N} (laufender + latenter) Steueraufwand_{it}}{\sum_{t=1}^{T} \sum_{i=1}^{N} Jahresergebnis vor Steuern_{it}} \tag{4.1}$$

mit *i = Unternehmen* und *t = Beobachtungsjahr*. Die Grüne/EFA-Studie nennt eine gewichtete ETR für deutsche Unternehmen i.H.v. 19,6 % und verwendet das unkorrigierte handelsrechtliche Ergebnis vor Steuern als Referenzgröße (Nenner in Gleichung 4.1), wie dies in der Literatur durchaus üblich ist.[23] Als Begründung wird auf Seite 9 angeführt: „The data is not able to properly take into account some specific characteristics of various tax systems". Wie in Abschnitt 4.4.1 und 4.4.2 gezeigt werden wird, beeinflusst dies zumindest für deutsche Unternehmen die gewonnenen Ergebnisse.

Neben der gewichteten ETR ist im vorliegenden Beitrag auch die ungewichtete (durchschnittliche) ETR[24] deutscher Unternehmen von Interesse.

Die ungewichtete ETR bestimmt sich wie folgt:

$$ETR_{ungewichtet} = \frac{\sum_{i=1}^{N} ETR_i}{N} \tag{4.2}$$

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[19] Für einen umfassenden Überblick s. Hanlon und Heitzman (2010).

[20] In der Regel wird dabei wie bei Janský (2019) das Jahresergebnis vor Steuern aus der GuV verwendet. Man kann jedoch ebenso ein modifiziertes Jahresergebnis vor Steuern heranziehen, das beispielsweise der Steuerfreistellung von Dividenden oder anderen Erträgen Rechnung trägt.

[21] Wenn im Folgenden von gewichteter ETR die Rede ist, ist die gewichtete durchschnittliche ETR gemeint.

[22] Eine Steuerquote wird oftmals auch in Bezug auf die Gesamtwirtschaft angegeben, wobei die gesamten Steuereinnahmen des Staates durch das gesamte Einkommen seiner Bürger geteilt werden.

[23] Vgl. bspw. Markle und Shackelford (2012).

[24] Wie bei den gewichteten ETRs wird die ungewichtete durchschnittliche ETR im Folgenden nur als ungewichtete ETR bezeichnet.

Die ungewichtete ETR gibt an, welcher Steuerbelastung deutsche Kapitalgesellschaften im Durchschnitt unterliegen, ohne dass die Gewinnhöhe eine Rolle spielt.[25] Ungewichtete ETRs sind u.a. für Verteilungsanalysen hilfreich. So liefert der Vergleich der ungewichteten mit der gewichteten ETR einen ersten Hiweis, ob Unternehmen unterschiedlicher Größe unterschiedliche ETRs aufweisen.

4.3.2 Dafne als Datenbasis des vorliegenden Beitrags

Die Grüne/EFA-Studie basiert auf der Unternehmensdatenbank „Orbis", die Finanz- und Beteiligungsinformationen zu rund 300 Millionen Unternehmen weltweit enthält, und analysiert die Abweichung von ETRs zu Nominalsteuersätzen für Unternehmen sämtlicher EU-Staaten sowie ausgewählter Drittstaaten.

Um die im vorliegenden Beitrag interessierenden Ergebnisse für Deutschland zu replizieren, wird in Ermangelung einer Lizenz für die Orbis-Datenbank auf die Dafne-Datenbank zurückgegriffen, die vom selben Anbieter (Bureau von Dijk) wie Orbis vertrieben wird. Dafne enthält Jahresabschlussinformationen von ca. 1 Million Unternehmen in Deutschland. Orbis umfasst je nach Orbis-Paket mehr oder weniger dieser deutschen Unternehmen.[26] Somit ist eine Replikation der Ergebnisse der Grüne/EFA-Studie mit den Dafne-Daten grundsätzlich möglich.

4.3.3 Sample-Selection

In diesem Abschnitt wird die von uns vorgenommene Stichprobenauswahl dokumentiert und mit den Ergebnissen der Grüne/EFA-Studie verglichen. Ein unmittelbarer Vergleich mit dem Vorgehen der Studie ist schwierig, wenn nicht gar unmöglich, da die Stichprobenauswahl nicht dokumentiert und das weitere Vorgehen der Studie kaum beschrieben wird. Auch werden keinerlei deskriptive Statistiken von den analysierten Unternehmen präsentiert. Dadurch ist nicht eindeutig zu klären, inwieweit die im vorliegenden Beitrag betrachteten Unternehmen der in der Grüne/EFA-Studie untersuchten Population hinreichend ähnlich sind. Der Leser erfährt aus der Studie lediglich, dass sich 10.346 deutsche Unternehmen im Sample befinden.

Wir haben alle Unternehmen aus Dafne ausgewählt, für welche Daten zur Gewinn- und Verlustrechnung in den Jahren 2011 bis 2015 zur Verfügung stehen und die nicht der Finanzindustrie zugehörig sind. Um analog zur Grüne/EFA-Studie ETRs auf Basis von Einzelabschlüssen ermitteln zu können, wurden 137 Unternehmen aus dem Dafne-Datensatz entfernt, für die ausschließlich Konzernabschlüsse vorliegen. Bei Unternehmen mit Einzel- und Konzernabschluss haben wir die Einzelabschlüsse verwendet. Unser „Ausgangssample" umfasst 31.689 deutsche Unternehmen.[27]

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[25] Aus diesem Grund geben Bräutigam, Ludwig und Spengel (2019) der Analyse ungewichteter ETRs den Vorzug.

[26] Laut dem Shared Service Center des Bureau von Dijk (BvD) gibt es keine systematischen Unterschiede zwischen den Daten für deutsche Unternehmen in der Orbis-Datenbank und denen in der Dafne-Datenbank.

[27] Für die übrigen rund 970.000 Unternehmen liegen keine GuV-Angaben für den gesamten Analysezeitraum vor.

Weiterhin haben wir analog zur Grüne/EFA-Studie folgende Datenbereinigungen vorgenommen, um anhand unseres „Replikationssamples" die Ergebnisse der Studie zu replizieren:

1. Wir haben sämtliche Unternehmen eliminiert, welche 2010 einen Verlust erlitten haben, um Verzerrungen aus der Existenz steuerlicher Verlustvorträge zu reduzieren.

2. Wir haben Unternehmen aus der Stichprobe entfernt, wenn diese über den gesamten Betrachtungszeitraum 2011–2015 in Summe ein negatives Ergebnis erzielt haben.[28]

3. Erhält ein Unternehmen in einzelnen Jahren Steuererstattungen, wurden diese Jahre bei dem Unternehmen (firmyear observations) gelöscht.[29]

4. Gleiches gilt für Jahre, in denen ein Unternehmen eine ETR größer als 100 % aufweist. Auch diese firm-year observations wurden eliminiert.[30]

5. Unternehmen, bei denen nach der Bereinigung aus Schritt 3 und 4 weniger als 3 Beobachtungen verbleiben, haben wir aus dem Datensatz entfernt. Somit liegen für jedes analysierte Unternehmen Daten für mindestens 3 Jahre vor.

Die in Schritt 3 und 4 gewählte Vorgehensweise ist in der Literatur weit verbreitet[31] und wird damit begründet, dass ETRs kleiner null und größer 100 % unplausibel seien.[32]

Die Auswirkungen der Datenbereinigungen, ausgehend von unserem „Ausgangssample" (Schritt 0) bis hin zum „Replikationssample" (Schritt 5), sind in Tabelle 4.1 dargestellt:

TABELLE 4.1: Stichprobenauswahl für die Replikation der Ergebnisse der Grüne/EFA-Studie

Schritt	N [firm-years]	ETR ungewichtet	ETR gewichtet	durchschn. Bilanzsumme
0	31.689 [158.445]	18,7 %	20,3 %	104 Mio. €
1	26.942 [134.710]	20,6 %	18,8 %	108 Mio. €
2	24.146 [120.730]	27,6 %	17,3 %	108 Mio. €
3	24.146 [158.445]	25,3 %	19,3 %	108 Mio. €
4	24.146 [112.929]	23,3 %	19,6 %	108 Mio. €
5	23.602 [112.171]	23,6 %	19,8 %	101 Mio. €

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[28] Wir gehen davon aus, dass die Grüne/EFA-Studie auch so vorgegangen ist. Dazu heißt es auf S. 10: "When a company has negative profits in the period, we remove the company from the sample".

[29] Vgl. auch Markle und Shackelford (2009, S. 12).

[30] Markle und Shackelford (2009, S. 12) eliminieren bereits firm-year observations, wenn die ETR 70 % übersteigt.

[31] Vgl. bspw. Rego (2003) und Thomsen und Watrin, 2018. Alternativ zum Löschen solcher firm-year observations wird als Vorgehensweise auch gewählt, dass im Fall einer ETR kleiner als 0 % die ETR gleich 0 % und im Fall einer ETR größer 100 % die ETR gleich 100 % gesetzt wird. Damit soll vermieden werden, Beobachtungen zu verlieren, vgl. dazu bspw. Gupta und Newberry (1997, S. 12) oder (Kraft, 2014, S. 7).

[32] So z.B. Markle und Shackelford (2012, S. 499).

Die Bereinigung in Schritt 1 um Unternehmen, die in 2010 einen Verlust erzielten, führt zu einer Erhöhung der ungewichteten ETR und zu einer Reduktion der gewichteten ETR. Dieses im Hinblick auf die gewichtete ETR zunächst überraschende Ergebnis erklärt sich dadurch, dass die „2010-Verlustunternehmen" im Betrachtungszeitraum zwar insgesamt Steuern zahlen (ungewichtete ETR = 7,7 %), aggregiert aber einen Verlust in den Jahren 2011-2015 erleiden. Deshalb ist der aggregierte Gewinn der verbleibenden Unternehmen höher, obgleich diese 4.747 Unternehmen aus dem Ausgangssample fehlen. Dadurch wird der Nenner in Gleichung 4.1 trotz sinkender Unternehmenszahl größer, was zu dem – auf den ersten Blick paradoxen – Effekt einer sinkenden gewichteten ETR führt. Derselbe Mechanismus wirkt im 2. Bereinigungsschritt.

Unser Replikationssample umfasst etwas mehr als doppelt so viele Unternehmen wie das Sample der Grüne/EFA-Studie. Woher diese Diskrepanz kommt, ist ebenso unklar wie die Frage, ob und ggf. wie sich die Unternehmen unseres Replikationssamples von den 10.346 Unternehmen der Studie unterscheiden. Dies liegt daran, dass – wie bereits erwähnt – in der Studie die Sample-Selection nicht ausführlich beschrieben und keine deskriptive Statistik für die analysierten Unternehmen bereitgestellt wird.

Interessanterweise ist unser Ergebnis (19,8 %) im Hinblick auf die gewichtete ETR nahezu identisch mit dem in der Studie präsentierten Wert i.H.v. 19,6 %, wie Tabelle 4.2 belegt.

TABELLE 4.2: Ergebnis der Replikation und Vergleich mit der Grüne/EFA-Studie

	Replikation	Grüne/EFA Studie
Datengrundlage	Dafne	Orbis
N	23.602	10.346
$ETR_{gewichtet}$	**19,8 %**	**19,6 %**
$ETR_{ungewichtet}$	23,6 %	

Daher ist auch bei Betrachtung der Ergebnisse unseres Replikationssamples eine deutliche Minderbesteuerung zu attestieren.

Auch stützt der Vergleich der ungewichteten mit der gewichteten ETR (23,6 % vs. 19,8 %) die – nicht weiter dokumentierten – Ergebnisse der Studie, wonach größere Unternehmen im Mittel geringere ETRs als kleinere Unternehmen aufweisen.

Tabelle 4.3 präsentiert eine deskriptive Statistik, die zeigt, dass sich die Unternehmen in unserem Ausgangssample und in unserem Replikationssample sehr ähneln. Lediglich das durchschnittliche EBIT weist im Replikationssample einen deutlich höheren Wert auf.

TABELLE 4.3: Deskriptive Statistik für das Ausgangssample und das Replikationssample

Variable	N	Durchschnitt	Median	SD	Min.	Max.
vor Stichprobenauswahl "Ausgangssample"						
Bilanzsumme (T€)	31.689	104.390	13.519	1.324.659	1	104.690.600
Umsatzerlöse (T€)	31.689	144.628	32.195	1.302.602	0	80.943.000
EBIT (T€)	31.689	3.280	802	53.085	-4.184.400	4.323.400
Beteiligungserträge (T€)	31.689	1.273	0	29.337	-5.613	3.338.800
Mitarbeiter	31.689	244	95	1.733	1	170.781
FK-Quote (%)	31.689	62	65	27	0	128
nach Stichprobenauswahl "Replikationssample"						
Bilanzsumme (T€)	23.602	100.640	13.569	1.386.650	2	104.690.600
Umsatzerlöse (T€)	23.602	155.113	36.054	1.456.732	1	80.943.000
EBIT (T€)	23.602	4.561	1.144	58.950	-4.184.400	4.323.400
Beteiligungserträge (T€)	23.602	1.337	0	30.806	-517	3.338.800
Mitarbeiter	23.602	243	95	1.905	1	170.781
FK-Quote (%)	23.602	59	61	26	0	100

4.3.4 Unzulänglichkeiten der Grüne/EFA-Studie

Obwohl die Ergebnisse unserer Replikationsstudie den zentralen Befund der Grüne/EFA-Studie bestätigen, bedeutet dies nicht, dass dieses Ergebnis auch zutreffend ist. Dies hat zwei Gründe.

1. Die Studie verwendet das unmodifizierte handelsrechtliche Jahresergebnis vor Steuer. Die Wirkung von § 8b KStG, der Beteiligungserträge (Dividenden und Veräußerungsgewinne aus Beteiligungen an Kapitalgesellschaften) steuersystematisch (zu 95 %) freistellt,[33] bleibt unberücksichtigt.[34] Damit wird die ETR von Unternehmen, die Beteiligungserträge vereinnahmen, als zu gering ausgewiesen.

2. Ein Blick auf die drei Peaks in der Verteilung der ETRs im Replikationssample zeigt, dass sich Unternehmen im Sample befinden, die für die untersuchte Fragestellung offensichtlich dort nicht hingehören (s. Abbildung 4.1). Da sich die Orbis-Daten für deutsche Unternehmen der Dafne-Datenbank bedienen, dürfte dies auch für das Sample der Grüne/EFA-Studie gelten.

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[33] Für Dividenden gilt die Körperschaftsteuerfreistellung seit 1.1.2013 gem. § 8b Abs. 4 KStG erst ab einer Beteiligungsquote i.H.v. 10 % (vgl. BGBl. I, 561). Bei der Gewerbesteuer sind seit jeher lediglich Schachteldividenden steuerfrei gestellt. Die Mindestbeteiligungsquote beträgt gem. § 9 Nr. 2a und 7 GewStG seit 2007 15 % (§ 9 Nr. 2a, 7 und 8 GewStG) und bei EUTochterkapitalgesellschaften 10 %.

[34] Ein derartiges Vorgehen findet sich in vielen Studien, die unternehmerische ETRs zum Gegenstand haben (vgl. bspw. auch Markle und Shackelford (2009) und Markle und Shackelford (2012)).

ABBILDUNG 4.1: Verteilung der ETRs im Replikationssample
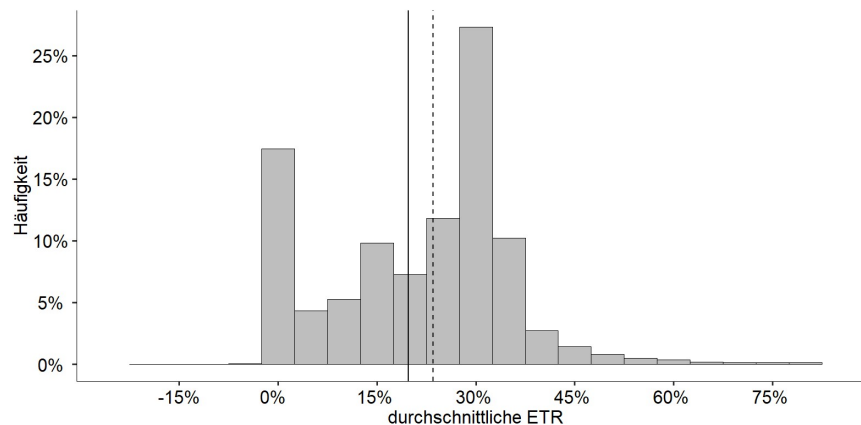
Hinweis: Die durchgezogene Linie zeigt den gewichteten Durchschnitt von 19,8 %, die gestrichelte Linie den ungewichteten Durchschnitt von 23,6 %.

Die drei Peaks befinden sich im Bereich 0 %, 15 % und in der Nähe des Nominalsteuersatzes.[35] Dass ein signifikanter Anteil der Unternehmen über fünf Jahre gerechnet keine Steuern zahlt (ETR = 0 %) oder eine ETR in der Größenordnung von 15 % aufweist, ist ein Hinweis darauf, dass das Replikationssample (und damit vermutlich auch das Sample der Grüne/EFA-Studie) nicht geeignet ist, verlässliche Aussagen über die ETR deutscher Kapitalgesellschaften zu machen. Aus diesem Grund wird das Replikationssample in Abschnitt 4.4.1 entsprechend modifiziert.

Neben diesen beiden gravierenden Schwächen, welche die Ergebnisse in erheblichem Umfang verfälschen, gibt es auch systematische Kritikpunkte an der Art der Datenbereinigung in der Studie. So werden firm-year observations für Jahre, in denen ein Unternehmen eine Steuererstattung vereinnahmt, ebenso gelöscht wie firm-year observations, wenn die ETR größer als 100 % ist. Obgleich dieses Vorgehen in der Literatur verbreitet ist, ist es durchaus fragwürdig. Da Steuerzahlungen eines Jahres infolge einer Betriebsprüfung auch Steuererstattungen oder -nachzahlungen für vorangegangene Jahre beinhalten können,[36] sind ETRs kleiner null oder größer 100 % kein zwingendes Indiz für einen Datenfehler. Ein Löschen von firm-year observations ist nur dann zu rechtfertigen, wenn tatsächlich Datenfehler vorliegen oder die Steuerzahlungen zwischen den einzelnen Perioden unabhängig voneinander sind. Letzteres ist zumindest bei betriebsprüfungsbedingten Steuererstattungen oder -nachzahlungen nicht gegeben, so dass in diesem Fall eine unzutreffende ETR für das betreffende Unternehmen im Betrachtungszeitraum ermittelt wird. Auch sind die Grenzen von 0 % und 100 % willkürlich. Genauso gut könnte man ETRs kleiner 5 % oder größer 90 % als unplausibel einstufen und entsprechende firm-year observations löschen.

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[35]   Gebhardt und Siemers (2017, S.23) finden im Gegensatz zu uns eine bipolare Verteilung der effektiven Steuerquoten deutscher Kapitalgesellschaften.

[36]   Vgl. Markle und Shackelford (2012, S. 497) die sich auf Cash Taxes beziehen.

4.4 Tatsächliche ETRs deutscher Kapitalgesellschaften

4.4.1 ETRs bei sachgerechter Sample-Selection und Berücksichtigung steuerfreier Dividenden

In diesem Abschnitt ermitteln wir gewichtete und ungewichtete ETRs deutscher Kapitalgesellschaften basierend auf einer sachgerechten Sample-Selection und unter Berücksichtigung der Steuerfreiheit von Beteiligungserträgen (§ 8b KStG). Ausgangsbasis ist dabei das Replikationssample aus dem vorherigen Abschnitt.

Im *ersten Schritt* haben wir zum einen die Datenbereinigung aus Schritt 3 und 4 (Löschen von firm-year observations im Fall von Steuererstattungen oder ETRs größer als 100 %) rückgängig gemacht und die Steuerfreistellung durch § 8b Abs. 1 KStG (und korrespondierend § 9 Nr. 2a GewStG) berücksichtigt.[37] Wir wählen dabei einen eher konservativen Ansatz,[38] indem wir unterstellen, dass lediglich 70 % der Beteiligungserträge auf steuerbefreite Dividenden entfallen.[39] Konservativ ist diese Annahme zum einen deshalb, weil § 8b Abs. 4 KStG erst im Jahr 2013 und damit nach der Hälfte des Betrachtungszeitraums eingeführt wurde. Zum anderen ist davon auszugehen, dass insbesondere große Unternehmen ihren Beteiligungsbesitz, z.B. durch Pooling, so strukturieren, dass steuerpflichtige Dividenden weitestgehend vermieden werden. Zudem dominieren Beteiligungen an Kapitalgesellschaften den Beteiligungsbesitz, auch wenn Beteiligungen an Personengesellschaften, die steuerpflichtige Beteiligungserträge generieren, eine gewisse Rolle spielen.[40]

Die Ergebnisse dieses ersten Schrittes sind in Tabelle 4.4 dargestellt.

TABELLE 4.4: Erster Schritt: Einbezug aller firm-years
und Berücksichtigung steuerfreier Beteiligungserträge

Modifikation	N [firm-years]	ETR ungewichtet	ETR gewichtet	durchschn. Bilanzsumme
Einbezug aller firm-years	23.602 [118.010]	28,1 %	18,3 %	101 Mio. €
Berücksichtigung steuerfreie Dividenden	23.602 [118.010]	26,9 %	21,0 %	101 Mio. €

Durch das Einbeziehen von firm-year observations mit Steuererstattungen und ETRs größer als 100 % steigt die Zahl der firm-year observations um 5.839, so dass für sämtliche der

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[37] Die Bereinigung des Vorsteuergewinns um „special items" ist auch in der Literatur anzutreffen (vgl. Dyreng, Hanlon und Maydew, 2008, S. 66), wenngleich dies meist unterbleibt.

[38] Bei Betrachtung von 20 zufällig ausgewählten Unternehmen zeigt sich, dass gut 9 % (20 %) ihres Beteiligungsbesitzes (anzahl-, nicht jedoch wertmäßig) nicht unter § 8b Abs. 1 KStG (und § 9 Nr. 2a GewStG) fällt.

[39] Bach und Buslei (2009, S. 10) nehmen dagegen eine Bereinigung um 100 % des Beteiligungsergebnisses vor.

[40] Bei Betrachtung von 20 zufällig ausgewählten Unternehmen zeigt sich, dass ihr Anteilsbesitz zu gut 10 % (anzahl-, nicht jedoch wertmäßig (Beteiligungswerte sind nicht angegeben)) aus Beteiligungen an Personengesellschaften besteht.

23.602 betrachteten Unternehmen die Ergebnisse eines jeden Jahres berücksichtigt werden. Die gewichtete ETR sinkt dadurch auf 18,3 % und die ungewichtete steigt auf 28,1 %. Der auf den ersten Blick paradoxe Effekt einer sinkenden gewichteten ETR bei einer steigenden ungewichteten ETR resultiert daraus, dass der Gesamtsteueraufwand aller Unternehmen sinkt, weil die aggregierten Steuererstattungen die Summe der Steuerzahlungen bei ETRs größer 100 % übersteigen.

Durch Adjustierung des handelsrechtlichen Ergebnisses um 95 % des 70 %igen Beteiligungsergebnisses (§ 8b KStG) ergibt sich das nachfolgend als „bereinigt" bezeichnete Jahresergebnis.[41] Verwendet man das bereinigte Jahresergebnis als Bezugsgröße bei Ermittlung der ETRs, dann sinkt die ungewichtete ETR auf 26,9 %,[42] wohingegen die gewichtete ETR auf 21,0 % steigt.[43] Es zeigt sich, dass die § 8b KStG-Bereinigung einen deutlichen Effekt auf die gewichtete ETR hat (+2,7 Prozentpunkte).[44]

Im *zweiten Schritt* haben wir eine erste Datenbereinigung vorgenommen und Unternehmen eliminiert, für die unplausible Steuerbelastungen vorliegen. Dazu zählen wir Unternehmen, die bezogen auf den gesamten 5-Jahres-Zeitraum eine ETR kleiner 0 % oder größer 100 % aufweisen.[45]

TABELLE 4.5: Zweiter Schritt: Ausreißerbereinigung

Modifikation	N [firm-years]	ETR ungewichtet	ETR gewichtet	durchschn. Bilanzsumme
ETR > 100 %	282 [1.410]	574,0 %	107,0 %	611 Mio. €
ETR < 0 %	560 [2.800]	-88,2 %	0,0 %	265 Mio. €
verbleiben	22.760 [113.800]	22,9 %	20,8 %	90 Mio. €

Tabelle 4.5 zeigt, dass die Ausreißerbereinigung insbesondere die ungewichtete ETR in hohem Maße beeinflusst, wohingegen sich die gewichtete ETR eher geringfügig ändert (20,8 % vs. 21,0 %). Bei Unternehmen mit einer ETR kleiner 0 % erklärt sich das auf den ersten Blick überraschende Ergebnis einer gewichteten ETR i.H.v. 0,0 % dadurch, dass die in

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[41] Hanlon und Heitzman (2010, S. 139) führen im Zusammenhang mit der Referenzgröße bei der Bestimmung von ETRs aus: "Understanding what the numerator captures is essential".

[42] Das Sinken der ungewichteten ETR erklärt sich dadurch, dass bei 270 Unternehmen das Jahresergebnis nach § 8b-Bereinigung und damit die ETR negativ wird. Neun dieser Unternehmen haben negative Steuerquoten von < -1.000 % (den Spitzenwert weist dabei die SMA Solar Technology AG mit – 9.176 % auf), was den ungewichteten Mittelwert äußerst stark beeinflusst. Da die aggregierten Verluste dieser 270 Unternehmen sehr gering sind, ist deren Einfluss auf die gewichtete ETR nahezu vernachlässigbar.

[43] Die in den nachfolgenden Tabellen bzw. Ausführungen angegebenen ETRs beziehen sich (wenn nichts anderes vermerkt ist) immer auf das bereinigte Jahresergebnis.

[44] Giegold (2019) von den Grünen/EFA ist sich der Notwendigkeit der Berücksichtigung steuerfreier Beteiligungserträge bewusst, argumentiert im Ergebnis aber dennoch dagegen.

[45] Vermutlich ist der Betrachtungszeitraum für diese Unternehmen zu kurz oder aber es liegen Datenfehler vor.

dieser Subpopulation enthaltenen Verlustunternehmen (Verlust nach Bereinigung um das Beteiligungsergebnis) in Summe fast genauso viel Steuern zahlen wie Gewinnunternehmen insgesamt an Steuererstattungen vereinnahmen.[46] Es zeigt sich anhand der Bilanzsumme, dass diese „Ausreißerunternehmen" deutlich größer sind als die übrigen Unternehmen. Dabei sind die Unternehmen mit ETRs größer 100 % nochmals deutlich größer als diejenigen mit ETRs kleiner 0 %.

Im *dritten Schritt* haben wir 517 Unternehmen, die ein Eigenkapital kleiner gleich null aufweisen, als „Negativ-EK-Unternehmen" eingestuft. Da diese Unternehmen regelmäßig über einen steuerlichen Verlustvortrag verfügen dürften, haben wir sie aus dem Sample eliminiert. Zum anderen haben wir Unternehmen eliminiert, deren (bereinigte) Gewinne im Betrachtungszeitraum nicht ausreichen, entstandene Verluste unter Berücksichtigung der Mindestbesteuerung gem. § 10d Abs. 2 EStG auszugleichen (Verlustvortragsunternehmen).[47] Dies betrifft 1.892 Unternehmen. Die Auswirkungen dieser Bereinigung auf beide ETR-Werte sind jedoch vernachlässigbar, wie der Vergleich von Tabelle 4.5 und Tabelle 4.6 belegt:

TABELLE 4.6: Dritter Schritt: Bereinigung um Unternehmen mit „übermäßigen" Verlusten

Modifikation	N [firm-years]	ETR ungewichtet	ETR gewichtet	durchschn. Bilanzsumme
Negativ-EK Unternehmen	517 [2.585]	14,2 %	7,3 %	76 Mio. €
Verlustvortrags-unternehmen	1.892 [9.460]	27,8 %	25,9 %	128 Mio. €
verbleiben	20.351 [101.755]	22,7 %	20,8 %	87 Mio. €

Es zeigt sich, dass Negativ-EK-Unternehmen äußerst niedrige ETRs aufweisen, so dass unsere Annahme der Existenz steuerlicher Verlustvorträge zutreffend erscheint. Bei den Verlustvortragsunternehmen liegen sowohl die gewichteten, als auch die ungewichteten ETRs über den korrespondierenden Werten der verbleibenden Unternehmen. Dies dürfte darauf zurückzuführen sein, dass sich die erzielten Verluste steuerlich im Betrachtungszeitraum

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[46] Von den insgesamt 560 Unternehmen mit einer ETR kleiner 0 % erzielen 408 (Gewinn-)Unternehmen im Aggregat einen bereinigten Gewinn i.H.v. 26,8 Mrd. € und erhalten Steuererstattungen i.H.v. rund 766 Mio. €, während 152 (Verlust-)Unternehmen insgesamt 675 Mio. € Steuern zahlen, obwohl sie eine aggregierten bereinigten Verlust i.H.v. – 1,9 Mrd. € erleiden.

[47] In diesem Zusammenhang ist darauf hinzuweisen, dass wir (§ 8b-KStG bereinigte) handelsrechtliche Verluste als Proxy für steuerliche Verluste verwendet haben, was mit einer gewissen Unschärfe verbunden ist. Im Zusammenhang mit der Approximation steuerlicher Verlustvorträge zeigen Niemann und Rechbauer (2013) für ein Sample österreichischer Aktiengesellschaften, dass dies anhand handelsrechtlicher Konzernabschlüsse nur bedingt gelingt. Nach Rechbauer (2016) lässt sich – bezogen auf ein italienisches Sample – bei 80 % der Unternehmen mit einem steuerlichen Verlustvortrag auch ausgehend vom handelsrechtlichen Einzelabschluss identifizieren, dass ein solcher besteht. Die Approximation der exakten Höhe des Verlustvortrags gelingt jedoch nur bedingt. Ein Blick auf Abbildung 4.3 zeigt für unser Sample zweifelsfrei, dass die ETR-Verteilung unserer Verlustvortragsunternehmen ungewöhnlich und deren Eliminierung gerechtfertigt ist.

nicht vollständig ausgewirkt haben. In diesem Fall wurden bezogen auf das Gesamtergeb-
nis des Beobachtungszeitraums zu viel Steuern bezahlt. Es gibt aber auch viele Unterneh-
men mit einer geringen ETR. So weisen mehr als 20 % der Verlustvortragsunternehmen
sogar eine ETR i.H.v. null auf. Dies dürfte an Verlusten aus Jahren vor 2010 liegen.

Die Verlustvortragsunternehmen sind (gemessen an der Bilanzsumme) größer als die üb-
rigen Unternehmen. Dagegen unterscheiden sich die Negativ-EK-Unternehmen in ihrer
Größe nicht von den übrigen Unternehmen. Dass eine Bereinigung des Samples um diese
beiden Arten von Unternehmen angezeigt ist, belegen die Abbildungen 4.2 und 4.3, wenn-
gleich sich unter den Verlustvortragsunternehmen auch viele Gesellschaften befinden, die
hinreichend steuerbelastet sind.

ABBILDUNG 4.2: Verteilung der ETRs der Negativ-EK Unternehmen
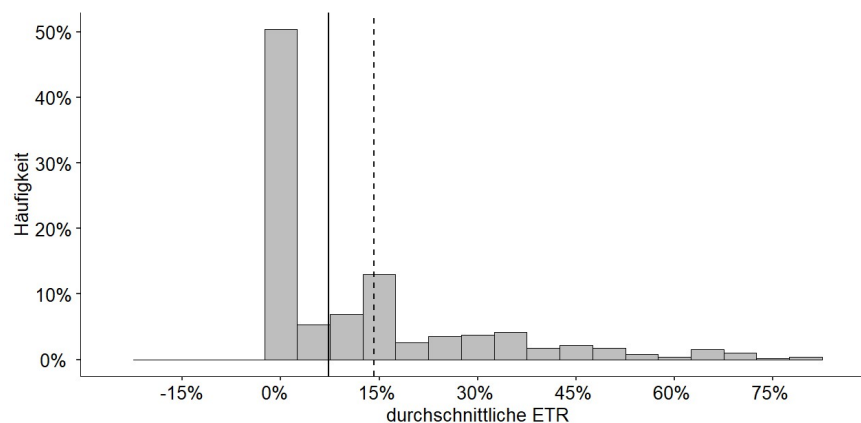
Hinweis: Die durchgezogene Linie zeigt den gewichteten Durchschnitt, die gestrichelte Linie den ungewichteten Durch-
schnitt.

ABBILDUNG 4.3: Verteilung der ETRs der Verlustvortragsunternehmen
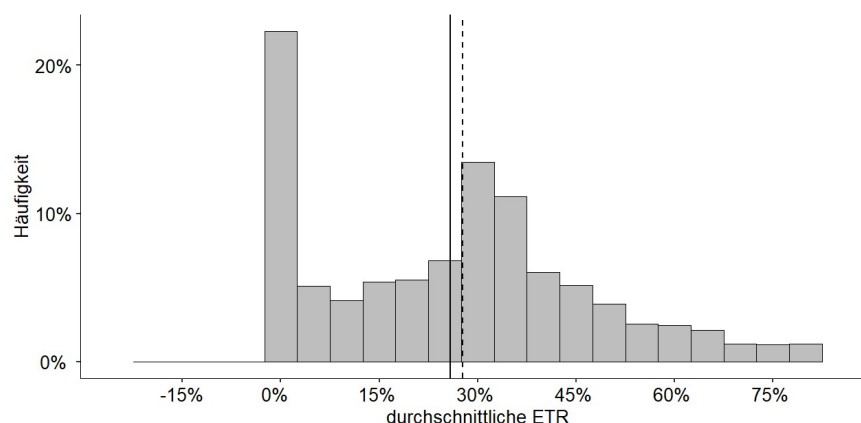
Hinweis: Die durchgezogene Linie zeigt den gewichteten Durchschnitt, die gestrichelte Linie den ungewichteten Durch-
schnitt.

Im *vierten Schritt* haben wir die im Sample verbliebenen Unternehmen mit einer ETR in der
Größenordnung von 0 % näher betrachtet. Dabei konnten wir Unternehmen identifizieren,
die steuerbefreit sind. Dies sind zum einen gemeinnützige Unternehmen, die wir anhand

der Firma und dem Fehlen nennenswerter Steuerzahlungen innerhalb des Beobachtungszeitraums identifiziert haben.[48] Zudem haben wir Personengesellschaften, die durchgehend nur die Gewerbesteuer ausweisen, eliminiert, wenn sie in der Wohnungswirtschaft tätig sind.[49] Aufgrund der erweiterten gewerbesteuerlichen Kürzung (§ 9 Nr. 1 S. 2 GewStG) fällt bei diesen Personengesellschaften oftmals keine Gewerbesteuer an. Zudem haben wir Genossenschaften aus der Wohnungsbranche eliminiert, da diese körperschaft- und gewerbesteuerbefreit sind.[50] Tabelle 4.7 zeigt, dass die Bereinigung des Samples um diese steuerbefreiten Unternehmen die ungewichtete und die gewichtete ETR um 1,6 Prozentpunkte bzw. 0,4 Prozentpunkte erhöht.

TABELLE 4.7: Vierter Schritt: Bereinigung um steuerbefreite Unternehmen

Modifikation	N [firm-years]	ETR ungewichtet	ETR gewichtet	durchschn. Bilanzsumme
Gemeinnützige Unternehmen	1.060 [5.300]	0,6 %	1,1 %	43 Mio. €
PG/Genoss. der Wohnungsbranche	329 [1.645]	0,8 %	0,8 %	122 Mio. €
verbleiben	18.962 [94.810]	24.3 %	21,2 %	89 Mio. €

Im *fünften Schritt* haben wir Unternehmen, die nicht die Rechtsform einer GmbH oder AG (inklusive SE) aufweisen, entfernt.[51] GmbHs und AGs, die in der Wohnungsbranche tätig sind, haben wir aufgrund der erweiterten gewerbesteuerlichen Kürzung (§ 9 Nr. 1 S. 2 GewStG) gelöscht.[52] Außerdem haben wir GmbHs und AGs der Gesundheits- und Bildungsbranche eliminiert, da diese zum Großteil unter die Gewerbesteuerbefreiung nach § 3 Nr. 13 und Nr. 20 GewStG fallen. Auch dadurch erhöhen sich beide ETRs im verbleibenden Sample (s. Tabelle 4.8).

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[48] Von keinen nennenswerten Steuerzahlungen wurden dabei bei einer ETR unter 5 % ausgegangen. In diesem Fall liegt die Vermutung nahe, dass diese gemeinnützigen Unternehmen andere Steuern wie die Grundsteuer den Steuern vom Einkommen und Ertrag zugerechnet haben, über einen geringfügigen wirtschaftlichen und damit steuerpflichtigen Geschäftsbetrieb verfügen (dies ist bspw. bei der Lungenklinik Lostau gGmbH der Fall) oder die Kapitalertragsteuer angesetzt haben, die sie auf Ausschüttungen abführen müssen.

[49] Die Einkommen- bzw. Körperschaftsteuer der Gesellschafter wird dagegen als Entnahme verbucht, wenn sie von der Personengesellschaft gezahlt wird.

[50] Analog zu den gemeinnützigen Unternehmen wurden keine nennenswerten Steuerzahlungen angenommen, wenn die ETR unter 5 % liegt. So hat die GEWIWO Berlin Wittenauer Wohnungsbaugenossenschaft eG die Kapitalertragsteuer, die sie auf Ausschüttungen an ihre Genossen abgeführt hat, als Aufwand bei den Steuern vom Einkommen und Ertrag ausgewiesen.

[51] Dabei dominiert die Rechtsform der GmbH Co. KG mit über 3.300 Unternehmen.

[52] Uns ist bewusst, dass die erweiterte Gewerbesteuerkürzung nicht für alle Unternehmen dieser Branche relevant ist, jedoch lässt sich die Unternehmen mit erweiterter Gewerbesteuerkürzung anhand der vorhandenen Daten nicht identifizieren.

TABELLE 4.8: Fünfter Schritt: Bereinigung um andere Rechtsformen und Kapitalgesellschaften besonderer Branchen

Modifikation	N [firm-years]	ETR ungewichtet	ETR gewichtet	durchschn. Bilanzsumme
andere Rechtsformen	3.860 [19.300]	18,7 %	16,0 %	53 Mio. €
GmbHs/AGs besonderer Branchen	922 [4.620]	14,2 %	17,0 %	112 Mio. €
verbleiben	14.180 [94.810]	26.5 %	22,1 %	97 Mio. €

ABBILDUNG 4.4: Verteilung der ETRs der "Andere Rechtsformen"
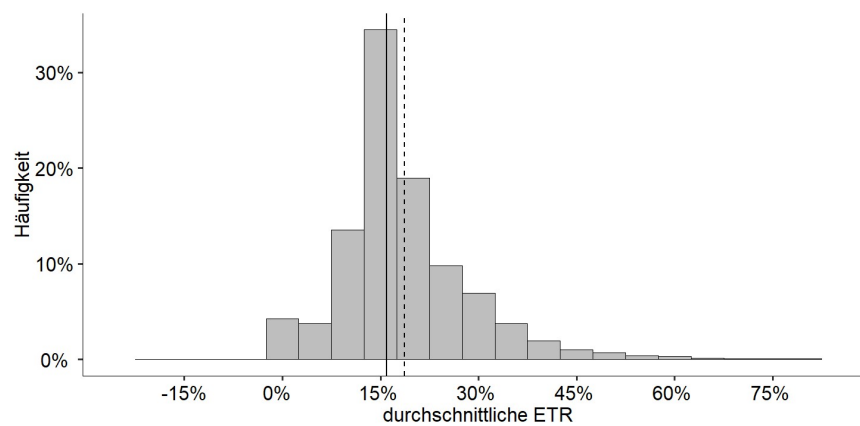
Hinweis: Die durchgezogene Linie zeigt den gewichteten Durchschnitt, die gestrichelte Linie den ungewichteten Durchschnitt.

ABBILDUNG 4.5: Verteilung der ETRs der "GmbHs und AGs besonderer Branchen"
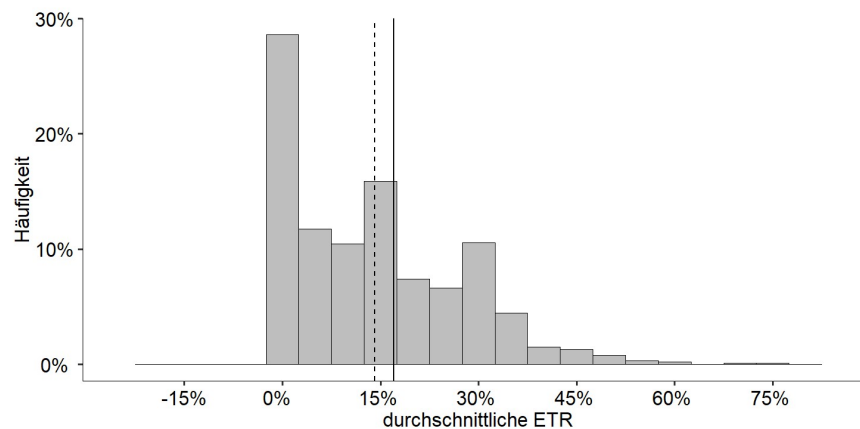
Hinweis: Die durchgezogene Linie zeigt den gewichteten Durchschnitt, die gestrichelte Linie den ungewichteten Durchschnitt.

Im *sechsten und letzten Schritt* haben wir Kapitalgesellschaften aus dem Sample elimi-
niert, die entweder als Organträger fungieren oder Organgesellschaft sind (Organkreis-
Kapitalgesellschaften) (s. Tabelle 4.9). Eine Kapitalgesellschaft haben wir als Organträger
eingestuft, wenn die Variablen „Erträge aus Gewinnübernahmen (Mutter)" oder „Auf-
wendungen aus Verlustübernahmen (Mutter)" Werte enthalten und die Variable „Verlust-
bzw. Gewinnabführung (Tochter)" keine Werte enthält.[53] Eine Kapitalgesellschaft wird
als Organgesellschaft eingestuft, wenn die Variable „Verlust- bzw. Gewinnabführung
(Tochter)" Werte enthält.[54]

TABELLE 4.9: Sechster Schritt: Bereinigung um Organkreis- Kapitalgesellschaften

Modifikation	N [firm-years]	ETR ungewichtet	ETR gewichtet	durchschn. Bilanzsumme
Ausgangssample aus Tabelle 4.8	14.180 [70.900]	26,5 %	22,1 %	97 Mio. €
Organkreis- Kapitalgesellschaften	3.901 [19.505]	17,7 %	19,7 %	284 Mio. €
Finales Sample	10.279 [51.395]	29,8 %	29,1 %	26 Mio. €

Es zeigt sich, dass für Kapitalgesellschaften des Finalen Samples beide ETRs (29,8 % bzw.
29,1 %)[55] nahe bei dem in der Grüne/EFA-Studie als Referenzwert herangezogenen Nomi-
nalsteuersatz i.H.v. 29,5 % liegen und die Ergebnisse der Studie einer sachgerechten Über-
prüfung nicht standhalten. Die auch im politischen Bereich aufgestellte pauschale Behaup-
tung „deutsche Kapitalgesellschaften zahlen zu wenig Steuern" lässt sich nicht aufrechter-
halten.

Abbildung 4.6 zeigt, dass rund 47,5 % der Kapitalgesellschaften des Finalen Samples eine
ETR im Bereich 30 % aufweisen, es aber auch eine beachtliche Streuung der ETRs gibt. Zu-
dem gibt es immer noch Kapitalgesellschaften, die eine Steuerquote in der Größenordnung
von 0 % aufweisen.[56] Da sich diese Kapitalgesellschaften jedoch nicht als gemeinnützig oder
als Kapitalgesellschaften mit steuerlichen Verlustvorträgen identifizieren lassen (s. dritter
und vierter Schritt der Sample-Selection), sind sie Teil des Finalen Samples, obgleich derart
niedrige Steuerquoten eigentlich nicht erklärlich sind.

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[53] Andernfalls ist das betreffende Unternehmen sowohl Organträger als auch Organgesellschaft und wurde
den Organgesellschaften zugerechnet.
[54] So auch Bach und Buslei (2009, S. 11)
[55] Auch die Annahme, das gesamte Beteiligungsergebnis ist nach § 8b KStG steuerfrei gestellt, ändert die
Ergebnisse kaum. In diesem Fall beträgt die ungewichtete ETR 29,7 % und die gewichtete ETR 29,9 %.
[56] 272 Unternehmen weisen eine ETR kleiner als 2,5 % aus.

ABBILDUNG 4.6: Verteilung der ETRs im Finalen Sample
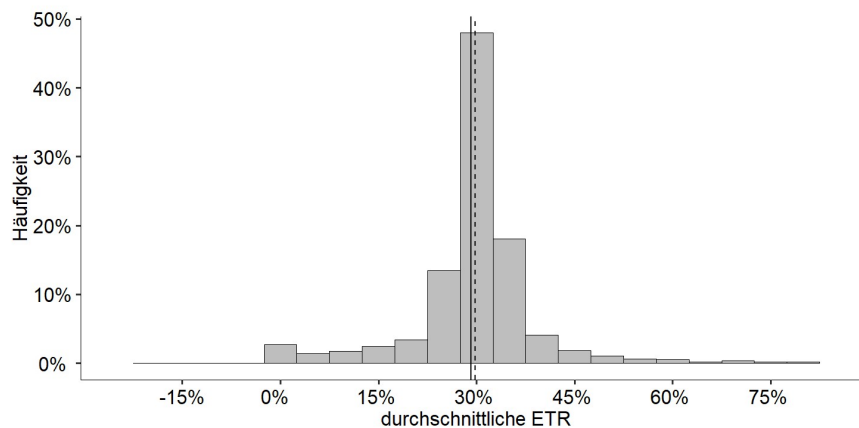
Hinweis: Die durchgezogene Linie zeigt den gewichteten Durchschnitt, die gestrichelte Linie den ungewichteten Durchschnitt.

In Abbildung 4.7 ist die ETR-Verteilung bei den ausgehend vom Replikationssample in den Schritten *eins* bis *sechs* eliminierten Unternehmen („Ausschlusssample") dargestellt. Die Verteilung belegt, dass viele eliminierte Unternehmen abnormale ETR Werte aufweisen, was den Ausschluss dieser aus dem Finalen Sample rechtfertigt.

ABBILDUNG 4.7: Verteilung der ETRs im Ausschlusssample
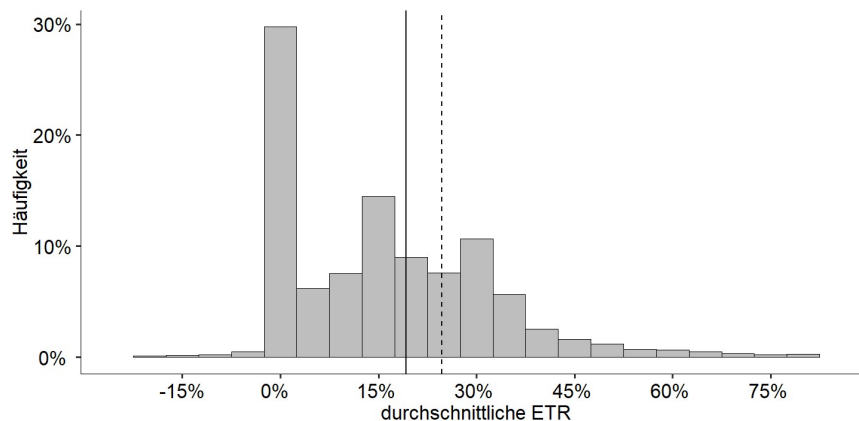
Hinweis: Die durchgezogene Linie zeigt den gewichteten Durchschnitt, die gestrichelte Linie den ungewichteten Durchschnitt.

Bei Betrachtung von Tabelle 4.9 fällt auf, dass die im Finalen Sample befindlichen Kapitalgesellschaften im Mittel deutlich kleiner als die des Replikationssamples sind (durchschnittliche Bilanzsumme 26 Mio. € vs. 101 Mio. €). Dies liegt vor allem am Aussondern sämtlicher Organkreis-Kapitalgesellschaften, die, bezogen auf die Bilanzsumme, im Durchschnitt mehr als zehnmal so groß sind wie die Kapitalgesellschaften des Finalen Samples (durchschnittliche Bilanzsumme 284 Mio. € vs. 26 Mio. €). Zudem vereinen die Organkreis-Kapitalgesellschaften mehr als 2/3 des gesamten Steueraufwandes sowie nahezu 3/4 des

aggregierten bereinigten Jahresergebnisses des Ausgangssamples (aus Tabelle 4.8) auf sich (vgl. Tabelle 4.9).[57]

Die Bedeutung von Organkreis-Unternehmen im Bereich großer Kapitalgesellschaften belegt auch Abbildung 4.8:

ABBILDUNG 4.8: Bedeutung der Organkreis-Kapitalgesellschaften
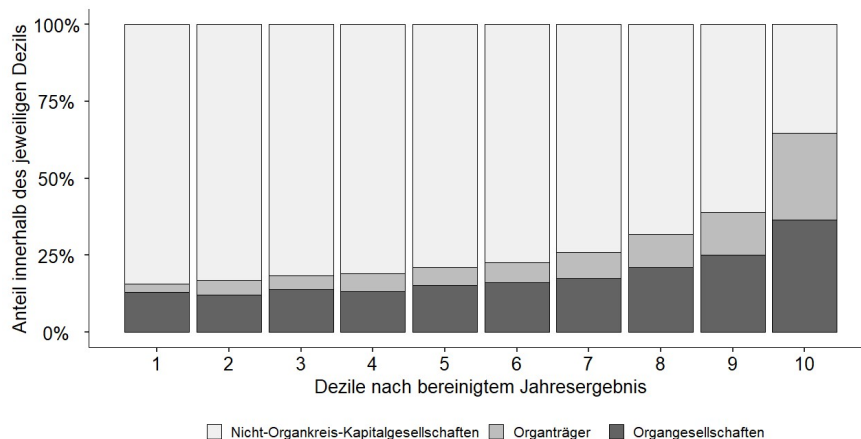
Hinweis: Die durchgezogene Linie zeigt den gewichteten Durchschnitt, die gestrichelte Linie den ungewichteten Durchschnitt.

Aufgrund der fiskalischen und gesamtwirtschaftlichen Bedeutung von Organkreis-Kapitalgesellschaften und auch weil gerade Großunternehmen im Verdacht stehen, in hohem Maße Steuergestaltungen zu nutzen, widmen wir der Subpopulation der Organkreis-Kapitalgesellschaften nachfolgend einen eigenständigen Abschnitt.

4.4.2 ETRs von Organkreis-Kapitalgesellschaften

Die Bereinigung des Finalen Samples um Organträger und Organgesellschaften erweist sich als notwendig, weil der Ausweis des Steueraufwandes in Organkreisen sehr unterschiedlich gehandhabt wird.

Organgesellschaften weisen in vielen Fällen einen Steueraufwand aus, obwohl aus steuerrechtlicher Sicht ein Steueraufwand von null oder nahe null (im Fall von Ausgleichzahlungen) zu erwarten wäre. Dies geschieht immer dann, wenn der Organträger einen Teil der Steuern, die er infolge des Organschaftsverhältnisses auf die ihm zugerechneten Gewinne zu zahlen hat, seiner Organgesellschaft (handelsbilanziell) „in Rechnung stellt". In diesem Fall weist die Organgesellschaft einen deutlich über null liegenden Steueraufwand aus. Jedoch erfolgt die Zuweisung des Steueraufwandes uneinheitlich – in manchen Fällen wird der Organgesellschaft der gesamte Steueraufwand aus Körperschaft- und Gewerbesteuer, in manchen Fällen nur der Gewerbesteueraufwand und in anderen Fällen keinerlei Steueraufwand angelastet –, so dass Organgesellschaften nicht verlässlich analysiert werden können.

Organträger lassen sich aber ebenfalls nicht ohne weiteres analysieren.

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[57] Das Ungleichgewicht zwischen dem gesamten Steueraufwand und den aggregierten Vorsteuergewinnen der Organkreis-Kapitalgesellschaften resultiert aus dem Doppelausweis der Gewinne der Organgesellschaften.

1. Organträger, welche ihrer Organgesellschaft den aus der Gewinnabführung resultierenden Steueraufwand in Rechnung stellen, weisen ihren Steueraufwand uneinheitlich aus. Zum einen gibt es Fälle, in denen der Organträger den vollen Steueraufwand ausweist, obgleich er seiner Organgesellschaft den durch diese induzierten Steueraufwand ganz oder teilweise anlastet. Dies ist, soweit ersichtlich, in den meisten Fällen der Fall. Es gibt aber auch Organträger, die nur den Teil ihres Steueraufwandes ausweisen, den sie nicht ihrer Organgesellschaft in Rechnung stellen.

2. Die Dividendenfreistellung gem. § 8b KStG kann bei Organträgern nicht vollumfänglich simuliert werden. Dies liegt daran, dass die von einer Organgesellschaft abgeführten Gewinne nach § 8b KStG befreite Dividenden enthalten können, welche auf Ebene des Organträgers aber nicht identifiziert werden können.[58] Daher kann eine „§ 8b KStG-Bereinigung" auf Ebene des Organträgers nur für vom Organträger selbst bezogene Dividenden, nicht jedoch für mittelbar über seine Organgesellschaften vereinnahmte Dividenden vorgenommen werden.

Beide Aspekte haben eine (in der Größenordnung nicht quantifizierbare) Unterschätzung der für die Organträger ermittelten ETRs zur Folge.

TABELLE 4.10: Sample-Split in Organträger und Organgesellschaften

Organkreis-Kapitalgesellschaften	N [firm-years]	ETR ungewichtet	ETR gewichtet	durchschn. Bilanzsumme
Organträger	1.297 [6.485]	29,1 %	24,1 %	568 Mio. €
Organgesellschaften	2.604 [19.505]	12,0 %	14,5 %	143 Mio. €

Tabelle 4.10 zeigt, dass Organträger eine ungewichtete ETR i.H.v. 29,1 % nahe dem Nominalsteuersatz aufweisen, wohingegen die gewichtete ETR mit 24,2 % deutlich darunter liegt. Dagegen liegen bei Organgesellschaften beide ETRs – wenig überraschend – erheblich unter dem Nominalsteuersatz.

Auch die Betrachtung der Verteilung der ETRs auf diese beiden Gruppen zeigt, dass eine Analyse der ETRs von Organgesellschaften wenig zielführend ist. Abbildung 4.9 belegt, dass nahezu die Hälfte der Organgesellschaften (45 %) eine ETR nahe 0 % ausweisen. Aber auch eine Analyse der ETRs der übrigen Organgesellschaften ist aufgrund der uneinheitlichen Zuordnung der Körperschaft- und Gewerbesteuer durch den Organträger nicht erfolgversprechend.

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[58] Im Datensatz ist nur die Position „Erträge aus Gewinnübernahmen (Mutter)" ausgewiesen.

ABBILDUNG 4.9: Verteilung der ETRs der Organgesellschaften
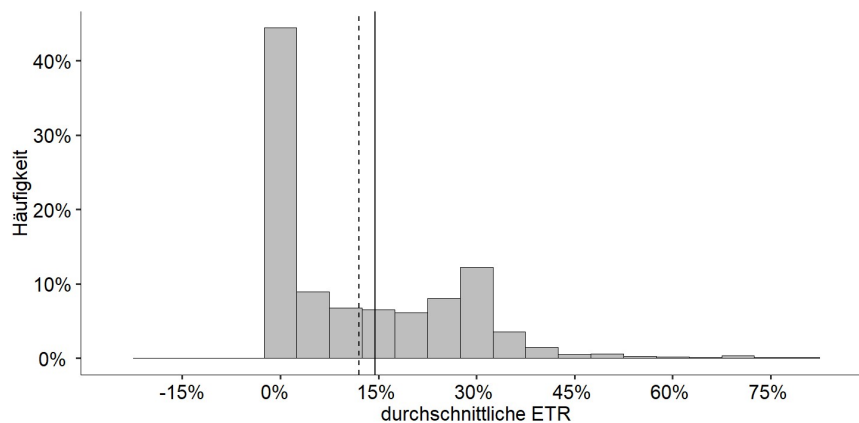
Hinweis: Die durchgezogene Linie zeigt den gewichteten Durchschnitt, die gestrichelte Linie den ungewichteten Durchschnitt.

ABBILDUNG 4.10: Verteilung der ETRs der Organträger
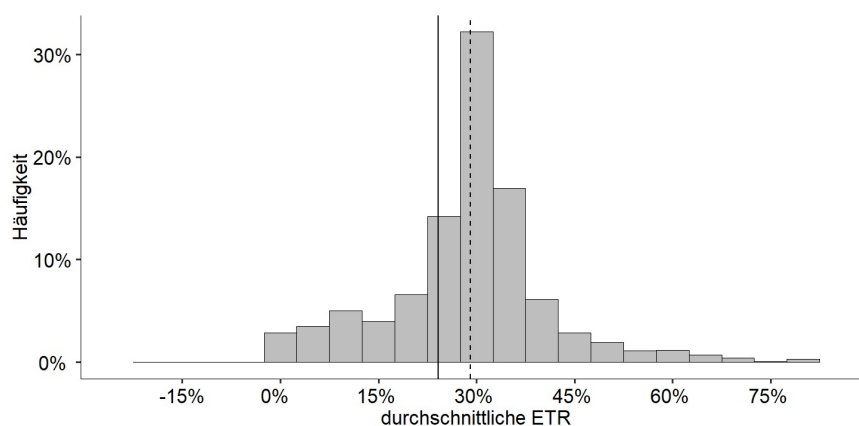
Hinweis: Die durchgezogene Linie zeigt den gewichteten Durchschnitt, die gestrichelte Linie den ungewichteten Durchschnitt.

Dagegen belegt Abbildung 4.10 eine ähnliche Verteilung der ETRs von Organträgern wie bei den Kapitalgesellschaften des Finalen Samples, wenngleich die gewichtete ETR niedriger ausfällt (Mittelwert 24,2 % vs. 29,1 %).

Daher lohnt eine genauere Analyse der Organträger. Zwar enthalten die von einer Organgesellschaft abgeführten Gewinne i.d.R. auch nach § 8b KStG befreite Dividenden, so dass, wie bereits erwähnt, eine § 8b KStG-Bereinigung der Gewinne des Organträgers nicht mit hinreichender Genauigkeit auf Mikroebene, d.h. auf Ebene der einzelnen Organträger, simuliert werden kann. Jedoch lässt sich unter der Annahme einer hinreichend großen Abdeckung der Organkreise durch die im Dafne- Datensatz enthaltenen Kapitalgesellschaften ein „Makroansatz" vornehmen, um zumindest einen Näherungswert für die ETR körperschaftlicher Organkreise zu erhalten.

Zur Ermittlung der Organkreis-ETR wird der Steueraufwand auf Ebene eines jeden Organträgers dem Gesamtsteueraufwand des jeweiligen Organkreises gleichgesetzt und über alle

($N = 1.297$) Organträger aufsummiert. Zugleich wird das Jahresergebnis eines jeden Organträgers um 70 % der von ihm (direkt) vereinnahmten Dividenden (zu 95 %) gekürzt. Das sich danach ergebende bereinigte Jahresergebnis wird über alle (N) Organträger aggregiert und um 95 % von 70 % der aggregierten Beteiligungserträge sämtlicher (M) Organgesellschaften gekürzt.

Mit Organkreis-ETR wird die gewichtete durchschnittliche ETR für sämtliche in Dafne enthaltenen körperschaftlichen Organkreise folgendermaßen bestimmt:[59]

$$Organkreis - ETR = \frac{\sum_{i=1}^{N} Steueraufwand\ OT_i}{\sum_{i=1}^{N} bereinigtes\ Jahresergebnis\ OT_i - 0,7 \cdot 0,95 \cdot \sum_{k=1}^{M} Beteiligungsertrge\ OG_k} \qquad (4.3)$$

Für unser Organkreis-Sample ergibt sich folgende Organkreis- ETR:

$$Organkreis - ETR = \frac{50,8\ Mrd.}{210,0\ Mrd. - 0,7 \cdot 0,95 \cdot 28,2\ Mrd.} = 26,6\,\%$$

Wenngleich die Organkreis-ETR i.H.v. 26,6 % mit Unschärfen behaftet ist, zeigt diese Größe, dass auch die Steuerbelastung deutscher Kapitalgesellschaften, die Teil eines Organkreises sind, weit oberhalb von 19,6 % liegt.[60]

Dabei ist zu berücksichtigen, dass die tatsächliche Organkreis-ETR aus zweierlei Gründen über dem Wert von 26,6 % liegt.

1. Wie bereits erwähnt, reduziert ein Teil der Organträger seine (eigene) Steuerbelastung um die seinen Organgesellschaften angelasteten Ertragsteuern. Dieser Teil der Organträger weist damit einen – bezogen auf den Organkreis – zu geringen Steueraufwand aus, so dass auch der aggregierte Steueraufwand zu gering ausfällt.

2. Eine Vergleich der aggregierten Erträge aus Gewinnübernahmen auf Ebene der Organträger mit den aggregierten abgeführten Jahresüberschüssen der Organgesellschaften zeigt, dass bei den Organträgern in Summe rund 16,4 % mehr Erträge aus Gewinnübernahmen zu verzeichnen sind, als die im Sample befindlichen Organgesellschaften insgesamt an Jahresüberschuss erzielen. Infolge der unvollständigen Abdeckung der Organgesellschaften fällt die § 8b KStG-Bereinigung zu niedrig aus.[61]

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[59] Aufgrund des Makroansatzes lässt sich die ungewichtete durchschnittliche ETR nicht berechnen.

[60] Unterstellt man, dass 100 % der Beteiligungserträge nach § 8b KStG steuerbefreit sind, beträgt die Organkreis-ETR 30,0 %. In diesem Fall beläuft sich das aggregierte bereinigte Jahresergebnis der Organträger (im Nenner) auf lediglich 195,6 Mrd. €.

[61] Auch ist ein Mismatch zwischen den im Sample enthaltenen Organträgern und den Organgesellschaften nicht auszuschließen. Zum einen ist denkbar, dass Kapitalgesellschaft-Organträger im Sample fehlen. Zum anderen ist es möglich, dass erfasste Organgesellschaften einem Personenunternehmen- Organträger zuzurechnen sind.

4.4.3 Erweiterte Analysen Robustness Checks

4.4.3.1 Unternehmensindividueller Nominalsteuersatz

Während den bisherigen Analysen der einheitliche Nominalsteuersatz i.H.v. 29,5 % als Referenzgröße zugrunde lag, verwenden wir in diesem Abschnitt unternehmensindividuelle Nominalsteuersätze.[62] Dies führt dazu, das sich die Kapitalgesellschaften unseres Finalen Samples Nominalsteuersätzen zwischen 22,825 % (Hebesatz 200 %) und 35,075 % (Hebesatz 550 %) gegenübersehen.[63]

Die in diesem Abschnitt verwendeten unternehmensindividuellen Nominalsteuersätze werden mit Hilfe des in der Sitzgemeinde der Kapitalgesellschaft geltenden Gewerbesteuer-Hebesatzes ermittelt.[64] Den Autoren ist durchaus bewusst, dass der tatsächliche Nominalsteuersatz einer Kapitalgesellschaft bei Existenz mehrerer Betriebsstätten in unterschiedlichen Gemeinden von dem hier verwendeten Wert abweicht. Dennoch dürfte die Verwendung des Hebesatzes am Sitz einer Kapitalgesellschaft ein besserer Proxy für den sich im Rahmen der Zerlegung ergebenden Gewerbesteuer-Hebesatz sein als der bundesweite Durchschnittswert.

TABELLE 4.11: Vergleich ETRs mit unternehmensindividuellen Nominalsteuersätze

	Ungewichtet	Gewichtet
ETR	29,77 %	29,13 %
unternehmensindividueller Nominalsteuersatz	29,82 %	29,80 %
Differenz	**- 0,05 PP**	**- 0,67 PP**

Vergleich der durchschnittlichen ETR mit den durchschnittlichen unternehmensindividuellen Nominalsteuersätzen im Finalen Sample. Für die Gewichtung der unternehmensindividuellen Nominalsteuersätze wurde entsprechend der Gewichtung der ETRs die bereinigten Jahresergebnisse verwendet.

Tabelle 4.11 zeigt, dass die mittleren unternehmensindividuellen Nominalsteuersätze (ungewichteter/gewichteter Wert: 29,82 %/29,80 %) kaum vom in der Studie verwendeten Nominalsteuersatz i.H.v. 29,5 % abweichen. Die geringe Differenz zwischen dem ungewichteten und gewichteten Wert deutet darauf hin, dass große Kapitalgesellschaften nicht stärker als andere Unternehmen in innerdeutschen „Gewerbesteueroasen" beheimatet sind. Zudem ist der durchschnittliche Unternehmenssteuersatz in unserem Finalen Sample fast deckungsgleich mit dem für 2015 von der OECD genannten Wert i.H.v. 29,78 %.[65] Dies spricht für eine gewisse räumliche Repräsentativität unseres Finalen Samples. Abbildung

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[62] In den Medien wurden auch die unterschiedlichen Gewerbesteuerhebesätze als möglicher Grund für die Differenz zwischen effektiver Steuerquote und dem Nominalsteuersatz genannt, vgl. Süddeutsche Zeitung (2019b).

[63] Die Gemeinden Zossen (Brandenburg) und Rögnitz (Mecklenburg-Vorpommern) erheben aktuell einen Hebesatz von nur 200 %. Der höchste Gewerbesteuerhebesatz in unserem Finalen Sample beträgt 550 % (z.B. Oberhausen (NRW)).

[64] Die Hebesätze wurden der jährlichen Ausgabe „Hebesätze der Realsteuern in Deutschland" der Statistische Ämter des Bundes und der Länder 2016 entnommen.

[65] Die OECD (2019) gibt für 2015 einen gewichteten Nominalsteuersatz von 29,78 % für Deutschland an.

4.11 stellt die Verteilung der ETRs und der unternehmensindividuellen Nominalsteuersätze dar.

ABBILDUNG 4.11: Verteilung der ETRs und unternehmensindividueller Nominalsteuersätze
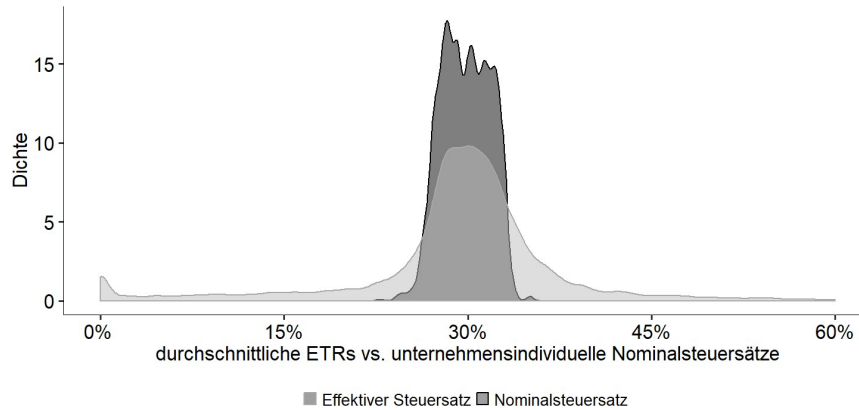
Hinweis: Kernel-Dichteschätzung für die ETRs und die unternehmensindividuellen Nominalsteuersätze. Die dunkelgraue Fläche zeigt die Verteilung der Nominalsteuersätze, die hellgraue die der ETRs.

4.4.3.2 Laufender Steueraufwand

Die effektive Steuerquote (ETR) wurde bislang gemäß Formel 4.1 in Abschnitt 4.3.1 als Quotient aus dem gesamten (laufenden + latenten) Steueraufwand und dem bereinigten Jahresergebnis vor Steuern berechnet. Um zu überprüfen, inwieweit latente Steuern das Ergebnis beeinflussen, betrachten wir in diesem Abschnitt die „Current-ETR" (CETR) also die ETR, die sich ergibt, wenn man nur auf den laufenden Steueraufwand abstellt.

Die gewichtete (durchschnittliche) CETR ergibt sich, indem der laufende Steueraufwand durch das bereinigte Jahresergebnis vor Steuern geteilt wird:

$$CETR_{gewichtet} = \frac{\sum_{t=1}^{T} \sum_{i=1}^{N} laufender\ Steueraufwand_{it}}{\sum_{t=1}^{T} \sum_{i=1}^{N} Jahresergebnis\ vor\ Steuern_{it}} \tag{4.4}$$

Die ungewichtete CETR bestimmt sich analog zur ungewichteten ETR wie folgt:

$$CETR_{ungewichtet} = \frac{\sum_{i=1}^{N} CETR_i}{N} \tag{4.5}$$

Die Ergebnisse bezogen auf das Finale Sample sind in Tabelle 4.12 dargestellt.

Es zeigt sich, dass sich ETR und CETR weitestgehend entsprechen. Dies schlägt sich auch im aggregierten Steueraufwand unseres Finalen Samples nieder (gesamter Steueraufwand: 37,0 Mrd. € vs. laufender Steueraufwand: 36,7 Mrd. €). Bei Organkreis-Kapitalgesellschaften ergibt sich sogar eine leicht höhere Organkreis-CETR i.H.v. 26,8 % im Vergleich zur Organkreis-ETR mit 26,6 % (gesamter Steueraufwand: 50,8 Mrd. € vs. laufender Steueraufwand: 51,2 Mrd. €).

TABELLE 4.12: Vergleich von durchschnittlichen ETR und CETR

	N [firm-years]	ETR ungewichtet	ETR gewichtet	CETR ungewichtet	CETR gewichtet
Finales Sample	10.279 [51.395]	29,9 %	29,1 %	29,8 %	28,9 %

4.4.3.3 Erweiterung des Betrachtungszeitraums auf 8 Jahre

Da jährliche ETRs bzw. CETRs starken Schwankungen unterliegen, verwendet Janský (2019) für seine Berechnungen einen 5-Jahres-Zeitraum. In diesem Abschnitt verwenden wir einen 8-jährigen Beobachtungszeitraum (2010 bis 2017) statt des Zeitraums von 2011-2015, um die Ergebnisse auf ihre Robustheit hin zu überprüfen. Die Verwendung eines 10-Jahres-Zeitraums, wie ihn (Dyreng, Hanlon und Maydew, 2008) – zumindest im Hinblick auf die Verwendung von Cash-ETRs – empfehlen, kommt aus zweierlei Gründen nicht in Betracht. Aufgrund der Finanzmarktkrise erscheint uns ein Zeitpunkt vor 2010 problematisch und bei Einbezug des Jahres 2018 würden wir sehr viele Kapitalgesellschaften verlieren.[66]

Es verbleiben 15.506 Kapitalgesellschaften in der Dafne-Datenbank, für die über einen 8-Jahres-Zeitraum für jedes Jahr Einzelabschlüsse inklusive einer brauchbaren Gewinn- und Verlustrechnung vorliegen. Entsprechend der Sample-Selection in Abschnitt 4.4.1 ergibt sich daraus ein „Finales 8-Jahres Sample" von 4.554 Kapitalgesellschaften. Zusätzlich haben wir ein Sample gebildet, welches diejenigen Kapitalgesellschaften enthält, die sowohl im Finalen Sample aus Abschnitt 4.4 als auch im Finalen 8-Jahres Sample enthalten sind (Matched Sample).

Die Ergebnisse in Tabelle 4.13 zeigen, dass die effektiven Steuerquoten im Finalen 8-Jahres Sample etwas höher sind als im Finalen (5-Jahres) Sample (vgl. Tabelle 4.9). Betrachtet man hingegen nur diejenigen 4.091 Kapitalgesellschaften, für welche die relevanten Daten sowohl im 5-Jahreszeitraum als auch im 8-Jahreszeitraum vorliegen (Matched-Sample), sind die ETRs unabhängig vom Betrachtungszeitraum nahezu identisch („Matched Sample 8-Jahres-Betrachtung" versus „Matched Sample 5-Jahres-Betrachtung").[67] Damit dürften Daten über aufeinanderfolgende 5 Perioden in den meisten Fällen ausreichen, um belastbare Aussagen über die Steuerbelastung von Kapitalgesellschaften zu treffen. Latente Steuern spielen im 8- Jahres-Zeitraum eine noch geringere Rolle als im 5-Jahres-Zeitraum.[68]

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[66] Bei Verwendung eines 10-Jahres-Zeitraums (2009–2018) würde die Datenbasis in Dafne nur noch 568 Unternehmen umfassen.

[67] Jedoch ist die Streuung der ungewichteten ETR im 8-Jahres-Zeitraum geringer. Die Standardabweichung der „Matched 8-Jahres Sample-ETR" beträgt nur 0,0802 verglichen mit 0,0912 der „Matched 5-Jahres Sample ETR".

[68] Für das Finale 8-Jahres Sample sind die CETR und ETR (gewichtet und ungewichtet) bei Betrachtung einer Nachkommastelle sogar identisch.

TABELLE 4.13: Erweiterung des Beobachtungszeitraums auf 8 Jahre

	N [firm-years]	ETR ungewichtet	ETR gewichtet	durchschn. Bilanzsumme
Finales 8-Jahres Sample	4.554 [36.432]	30,3 %	32,7 %*	34 Mio. €
Matched Sample 8-Jahres-Betrachtung	4.091 [32.728]	30,2 %	29,5 %	33 Mio. €
Matched Sample 5-Jahres-Betrachtung	4.091 [20.455]	30,4 %	29,5 %	30 Mio. €

*Das Ergebnis wird durch einen großen Ausreißer, der Wintershall AG, die aufgrund der Ölförderung in Libyen durchschnittlich Steuerquoten von über 90 % ausweist, getrieben. So enthält bspw. der Steueraufwand im Jahr 2013 i.H.v. 941 Mio. € in Libyen gezahlte Steuern von 856 Mio. €, die in Deutschland nicht angerechnet werden konnten. Ohne diese (große) Kapitalgesellschaft ergibt sich eine gewichtete ETR von 29,6 %, wohingegen die ungewichtete ETR unverändert bleibt. Da die Wintershall AG im Jahr 2015 einen Verlust erleidet, ist sie aufgrund nicht genutzter Verlustvorträge nicht Teil des Finalen (5-Jahres) Samples (vgl. Dritter Schritt in Abschnitt 4.4.1).

4.5 Einfluss von Größe & Auslandsaktivität auf die Steuerbelastung

Nach sachgerechter Sample-Selection in Abschnitt 4.4 sind nur noch Kapitalgesellschaften im Finalen Sample, bei denen davon auszugehen ist, dass diese der regulären Besteuerung unterliegen. Dennoch weisen die unternehmensindividuellen ETRs eine beträchtliche Streuung auf, die auch von der Streuung der unternehmensindividuellen Nominalsteuersätze zum Teil erheblich abweicht (vgl. Abschnitt 4.4.3.1). In diesem Abschnitt möchten wir klären, ob bestimmte Unternehmenscharakteristika – insbesondere die Unternehmensgröße und Auslandsaktivität – die Variabilität der ETRs erklären können.

4.5.1 Univariate Analyse von Größe und Auslandsaktivität

Janský (2019) führt die Unternehmensgröße als Einflussfaktor auf die ETR an und stellt in 43 von 63 Ländern eine negative Korrelation von ETR und Bilanzsumme (als Maßgröße für Unternehmensgröße) fest; d.h. große Kapitalgesellschaften unterliegen demnach einer geringeren Steuerbelastung als mittlere und kleine Kapitalgesellschaften. Jedoch unterbleibt eine Quantifizierung dieses Effekts.

Um zu untersuchen, ob diese Behauptung auch für deutsche Kapitalgesellschaften zutrifft, verwenden wir die Einteilung der Kapitalgesellschaften in drei Größenklassen analog zur Studie von Janský (2019):[69]

- kleine Kapitalgesellschaften: weniger als 10 Mio. € Bilanzsumme
- mittelgroße Kapitalgesellschaften: zwischen 10 und 100 Mio. € Bilanzsumme
- große Kapitalgesellschaften: mehr als 100 Mio. € Bilanzsumme

Bei Betrachtung der Ergebnisse, die sich bei Bestimmung der ETRs unter Verwendung der unbereinigten Jahresergebnisse analog zu Janskýs Vorgehen für das „Replikationssample"

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[69]   Anders als Janský stellen wir auf EURO ab, während dieser die Werte in US-Dollar bemisst.

ergeben (s. Abbildung 4.12), wird klar, wieso eine regressive Unternehmensbesteuerung (vermeintlich) identifiziert wird. Betrachtet man dagegen die ETRs, die sich unter Verwendung der um „§ 8b Abs. 1 KStG-Dividenden" bereinigten Jahresergebnisse für unser Finales Sample ergeben, erkennt man keinen eindeutigen Zusammenhang mehr.

Diesen Befund bestätigt auch der Kendall'sche Rangkorrelationskoeffizient (τ)[70] zwischen der durchschnittlichen ETR und der durchschnittlichen Bilanzsumme. Für das Replikationssample (mit unbereinigten Jahresergebnissen) ergibt sich ein τ von $-0,0318$ ($p - Wert = 0,0000$) und damit eine signifikante negative Korrelation beider Größen. Dagegen lässt sich für das Finale Sample (mit bereinigten Jahresergebnissen) mit einem τ von $-0,0057$ ($p - Wert = 0,3826$) kein signifikanter Zusammenhang feststellen.

ABBILDUNG 4.12: Vergleich der ETRs nach Unternehmensgröße
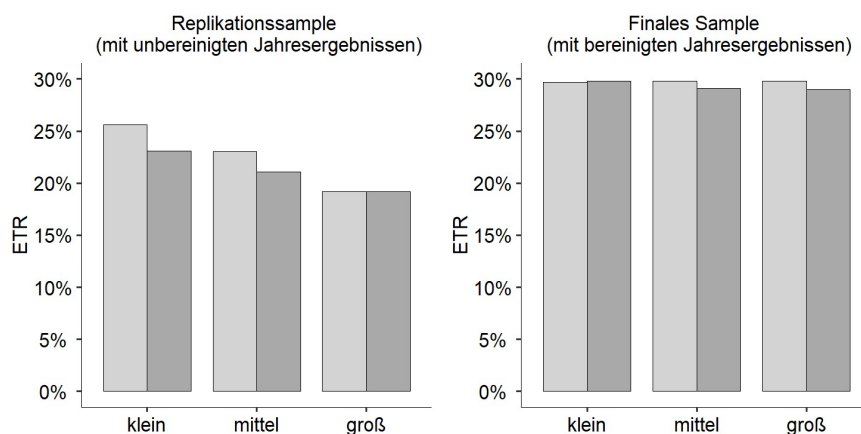
Hinweis: Vergleich der effektiven Steuerquoten nach Unternehmensgröße. Die hellgrauen Balken stellen die ungewichteten, die dunkelgrauen die gewichteten ETRs dar.

Wie bereits erwähnt, ist es nicht klar, ob das Sample von Janský (2019) auch lokale Unternehmen oder ausschließlich MNEs enthält. Gemäß dem Titel der Studie „Effective Tax Rates of Multinational Enterprises in the EU" dürften die analysierten 10.346 deutschen Unternehmen ausschließlich MNEs sein. Jedoch spricht Janský (2019) an manchen Stellen von "local companies" (so auf S. 12: "In effect, this is a weighted average of company-level ETRs of companies registered in country i, either local companies or MNE affiliates located there") und suggeriert, MNEs hätten eine geringere ETR als lokale Unternehmen. In der Pressemitteilung der Grünen/EFA vom 22.1.2019 wird dies sogar explizit behauptet: „Es ist nicht hinnehmbar, dass die größten grenzüberschreitend tätigen Unternehmen am stärksten vom Steuerdumping profitieren." Wir unterscheiden deshalb im Folgenden zwischen lokalen Unternehmen und MNEs.[71]

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[70] Dieser Rangkorrelationskoeffizient misst die Unterschiede der Rangfolge zweier Variablen und gilt somit als robust gegenüber Ausreißern. Zudem benötigt dieser Koeffizient keine Verteilungsannahme hinsichtlich der Variablen.

[71] Wir haben Unternehmen als MNEs definiert, wenn sie eine ausländische Globale Mutter und/oder ein ausländisches Tochterunternehmen haben.

Abbildung 4.13 zeigt, dass MNEs im „Replikationssample" (mit unbereinigten Jahres-ergebnissen) tendenziell sogar einer statistisch signifikanten (Mann-Whitney-U Test, $p = 0,0000$)[72] höheren Steuerquote ausgesetzt sind als lokale Kapitalgesellschaften.[73] Damit bleibt unklar, wie die Grünen/EFA zum gegenteiligen Ergebnis kommen. Dagegen lassen sich im Finalen Sample (mit bereinigten Jahresergebnissen) keine Unterschiede zwischen den ETRs feststellen.

ABBILDUNG 4.13: Vergleich der ETRs zwischen lokalen Kapitalgesellschaften und MNEs
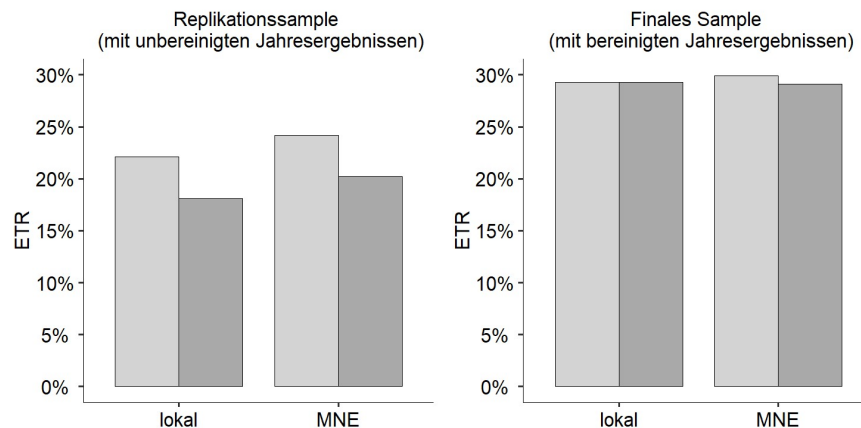
Hinweis: Vergleich der effektiven Steuerquoten zwischen lokalen Kapitalgesellschaften und MNEs. Die hellgrauen Balken stellen die ungewichteten, die dunkelgrauen die gewichteten Werte dar.

Es bleibt festzuhalten, dass anscheinend weder die Unternehmensgröße noch die Auslands-aktivität für die Steuerbelastung deutscher Kapitalgesellschaften eine Rolle zu spielen schei-nen. Ob dieser Befund auch im Rahmen einer multivariaten Analyse Bestand hat, ist Gegen-stand des nachfolgenden Abschnitts.

4.5.2 Multivariate Analyse

In Kapitel 4.2 hat sich gezeigt, dass die Erkenntnisse in der Literatur hinsichtlich der Effekte der Unternehmensgröße und Auslandsaktivität auf die unternehmerische ETR uneinheit-lich sind. Ein möglicher Grund dafür könnte sein, dass oftmals nur univariate Analysen – wie auch in der Studie von Janský (2019) – durchgeführt werden.[74] Mittels einer multiva-riaten Analyse möchten wir prüfen, wie diese beiden und andere Einflussfaktoren auf die ETRs deutscher Kapitalgesellschaften wirken. Dazu verwenden wir folgende Regressions-gleichung, wobei wir für die einzelnen Merkmale jeweils den Durchschnittswert aus dem 5-Jahres-Betrachtungszeitraum herangezogen haben:

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[72] Wir haben den Mann-Whitney-U Test verwendet, da die ETRs auch nicht näherungsweise normalverteilt sind, so dass ein t-Test nicht in Frage kommt.

[73] So auch Markle und Shackelford (2009) und Markle und Shackelford (2012).

[74] Darauf weisen auch Gupta und Newberry (1997, S. 2) hin: "However, a fundamental limitation of most of these studies is that they tend to have examined the ETR-firm size relation in a univariate framework, which potentially creates a correlated omitted variables problem."

$$ETR_i \; bzw. \; CETR_i = \beta_0 + \beta_1 \, BS_i + \beta_2 \, MNE_i + \beta_3 \, BE_i + \beta_4 \, VERB_i +$$
$$\beta_5 \, ROA_i + \beta_6 \, RS_i + \beta_7 \, IMVG_i + \beta_8 \, SAV_i + \qquad (4.6)$$
$$\beta_9 \, NDIFF_i + \beta_{10} \, VERLUST_i + \epsilon_i$$

mit:

ETR	= gesamter Steueraufwand/bereinigtes Vorsteuerergebnis
$CETR$	= laufender Steueraufwand/bereinigstes Vorsteuerergebnis
BE	= Erträge aus Beteiligungs/bereinigtes Vorsteuereregbnis
BS	= natürlicher Logarithmus der Bilanzsumme
MNE	= 1, wenn Konzernmutter oder Tochter im Ausland, sonst 0
$VERB$	= Verbindlichkeiten/Bilanzsumme
ROA	= Vorsteuergewinn/Bilanzsumme
RS	= Rückstellungen/Bilanzsumme
$IMVG$	= Immaterielle Vermögensgegenstände/Bilanzsumme
SAV	= Sachanlagevermögen/Bilanzsumme
$NDIFF$	= Abweichung unternehmensspezifischer Nominalsteuersatz vom Mittelwert
$VERLUST$	= 1, wenn mindestens in einem Jahr ein Verlust, sonst 0

Die uns besonders interessierenden unabhängigen Variablen sind die Merkmale BS als Größenmerkmal und MNE als Proxy für die Auslandsaktivität einer Kapitalgesellschaft. Neben den weiteren in der Literatur üblicherweise verwendeten Merkmalen (VERB, ROA, RS, IMVG, SAV) betrachten wir mit BE, NDIFF und VERLUST weitere erklärende Merkmale.

BE dient der Überprüfung, ob Beteiligungserträge einen systematischen Einfluss auf die ETR haben. Damit lässt sich auch kontrollieren, ob unsere pauschale Kürzung des Beteiligungsergebnisses um 70 %, um § 8b KStG Rechnung zu tragen, zumindest im Mittel gerechtfertigt ist. Mit VERLUST soll dafür kontrolliert werden, ob Verluste die ETR beeinflussen, was dafür spräche, dass innerhalb des Betrachtungszeitraums erlittene Verluste steuerlich nicht vollständig verrechnet werden können. Mit NDIFF kontrollieren wir für Gewerbesteuer-Hebesatz-Differenzen.

Aufgrund fehlender Werte für manche Variablen reduziert sich das Finale Sample von 10.279 Kapitalgesellschaften auf 9.232 Kapitalgesellschaften, bei denen sämtliche dieser Merkmale zumindest in einem Jahr besetzt sind.[75] Tabelle 4.14 bietet eine deskriptive Statistik für das „Regressionssample".

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[75] Bei den eliminierten Unternehmen ist folglich mindestens eins der erklärenden Merkmale durchgängig nicht besetzt.

TABELLE 4.14: Deskriptive Statistik des Regressionssamples

Variable	N	Mittelwert	Median	SD	Min.	Max.
ETR	9.232	0,301*	0,301	0,095	0,000	1,000
CETR	9.232	0,300*	0,301	0,103	-0,357	2,479
BE	9.232	0,033	0,000	0,118	-0,388	2,173
BS	9.232	9,511	9,388	1,033	0,470	15,172
MNE	9.232	0,773	1,000	0,419	0,000	1,000
VERB	9.232	0,411	0,393	0,231	0,000	1,060
ROA	9.232	0,120	0,094	0,111	0,000	2,812
RS	9.232	0,123	0,089	0,113	0,000	0,941
IMVG	9.232	0,014	0,003	0,043	0,000	0,930
SAV	9.232	0,211	0,153	0,179	0,000	0,844
NDIFF	9.232	0,000	0,000	0,019	-0,070	0,053
VERLUST	9.232	0,109	0,000	0,312	0,000	1,000

* Die gewichteten Mittelwerte betragen 29,2 % (ETR) bzw. 28,9 % (CETR). Da das Regressionssample nicht mit dem Finalen Sample übereinstimmt, kommt es zu den ETR/CETR-Abweichungen gegenüber den in den vorherigen Abschnitten präsentierten Werten.

Ein Vergleich der Werte aus Tabelle 4.14 mit den korrespondierenden Größen des Finalen Samples[76] zeigt keine nennenswerten Unterschiede. Daher ist davon auszugehen, dass die nachfolgend präsentierten Ergebnisse auch für das Finale Sample Gültigkeit besitzen.

Tabelle 4.15 auf der nächsten Seite zeigt die Ergebnisse unserer Cross-Sectional OLS-Regression.[77]

TABELLE 4.15: Ergebnis der Cross-Sectional OLS Regression

Variable	**ETR**			**CETR**		
	Koeffizienten	t-Statistik		Koeffizienten	t-Statistik	
Konstante	0,292849	21,705	***	0,293216	18,812	***
BE	0,009838	0,530		0,002493	0,133	
BS	-0,000567	-0,438		-0,000563	-0,378	
MNE	-0,001828	-0,789		-0,001986	-0,802	
VERB	0,030840	6,208	***	0,025088	4,836	***
ROA	-0,046615	-4,387	***	-0,047766	-4,424	***
RS	0,110729	7,736	***	0,122251	7,897	***
IMVG	0,069970	1,494		0,047960	7,897	
SAV	-0,036556	-5,760	***	-0,036615	-4,703	***
NDIFF	0,775460	15,880	***	0,781779	15,445	***
VERLUST	0,007652	1,467		0,012784	2,088	**
Adj. R^2	6,12 %			5,44 %		
F-Statistik	44,39			36,75		
p-Wert	0,00			0,00		

Ergebnis der Cross-Sectional OLS Regression der durchschnittlichen ETR/CETR (bezogen auf das *bereinigte* Jahresergebnis auf unterschiedliche Einflussfaktoren (definiert in Gleichung 4.6) unter Berückscihtigung robuster Standardfehler. Signifikanzniveaus: * $p < 0.1$; ** $p < 0.05$ und *** $p < 0.01$.

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[76] Die deskriptive Statistik mit den korrespondierenden Größen zum Finalen Sample findet sich in Tabelle D.1 im Anhang.

[77] In der Pearson's Korrelationsmatrix finden sich die stärksten Korrelationen zwischen VERB und ROA sowie VERB und RS (Korrelationskoeffizienten jeweils = -0,31). Der Varianzinflationsfaktor (VIF) bestätigt mit Werten kleiner als 1,3 für alle Variablen, dass Multikollinearität kein Problem für unseren Regressionsansatz darstellt.

Die Behauptung, große Unternehmen hätten niedrigere ETRs als kleinere, erweist sich auch bei einer multivariaten Analyse als unzutreffend. Zwischen Unternehmensgröße (BS) und ETR (CETR) besteht kein statistisch signifikanter Zusammenhang. Gleiches gilt für die Internationalität von Unternehmen; zwischen ETR (CETR) und MNE besteht ebenfalls kein statistisc signifikanter Zusammenhang. Verwendet man dagegen wie in der Grüne/EFA-Studie eine ETR als endogene Variable, die auf unbereinigten Jahresergebnissen basiert, und kontrolliert man nicht für das Beteiligungsergebnis, ergibt sich ein statistisch signifikanter negativer Zusammenhang zwischen Unternehmensgröße (nicht jedoch MNE) und ETR. Bezieht man dagegen das Beteiligungsergebnis in die Regression mit ein, sind wiederum weder der Koeffizient von BS noch der von MNE statistisch signifikant.[78]

Außerdem zeigt sich, dass der Anteil der Verbindlichkeiten am Gesamtvermögen (VERB) in unserem Sample positiv mit der ETR/CETR korreliert ist, während die Gesamtkapitalrendite (ROA) signifikant negativ korreliert ist (Signifikanzniveau jeweils 1 %). Beides ist aufgrund der gewerbesteuerlichen Hinzurechnung von Zinsen nach § 8 GewStG auch plausibel. Höhere Verbindlichkeiten führen zu mehr Zinsaufwand und folglich einem höheren Gewerbeertrag. Dieser Effekt fällt mit steigender Profitabilität jedoch immer weniger ins Gewicht. Des Weiteren weisen Kapitalgesellschaften mit höheren Rückstellungen (RS) höhere ETRs auf (Signifikanzniveau 1 %), was mit der restriktiveren steuerlichen Rückstellungsbildung erklärt werden kann. Der Anteil immaterieller Vermögensgegenstände (IMVG) spielt bei der ETR/CETR keine statistisch signifikante Rolle. Der Anteil des Sachanlagevermögens (SAV) ist negativ mit der ETR/CETR korreliert (Signifikanzniveau 1 %).[79]

Zwischen VERLUST und ETR zeigt sich kein statistisch signifikanter Zusammenhang, während dies bei der CETR auf einem Signifikanzniveau von 5 % der Fall ist. Dies deutet darauf hin, dass trotz unserer Verlustverrechnungssimulation im Zusammenhang mit dem Dritten Schritt der Sample-Selection (vgl. Abschnitt 4.4.1)[80] etliche Kapitalgesellschaften im Sample verblieben sind, die ihre Verluste innerhalb des betrachteten 5- Jahres-Zeitraums steuerlich nicht zur Gänze verrechnen konnten. Dies schlägt sich auf die CETR durch, während es bei der ETR durch die Bildung aktiver latenter Steuern scheinbar aufgefangen wird.[81]

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[78] Vgl. dazu Tabelle D.2 im Anhang.

[79] Zu diesem Ergebnis kommen u.a. auch Gupta und Newberry (1997), Richardson und Lanis (2007) und Sureth, Halberstadt und Bischoff (2009). Als Erklärung führen Gupta und Newberry (1997, S. 22) aus: "These results provide evidence that firms with a larger proportion of fixed assets tend to have lower ETRs as a result of tax preferences, whereas firms with a greater proportion of inventory (which do not have those tax shields tend to have higher ETRs)". U.E. bieten tax shields im Zusammenhang mit dem Anlagevermögen für Deutschland keine befriedigende Erklärung, da die steuerlichen Abschreibungsregeln grundsätzlich restriktiver als ihre handelsrechtlichen Pendants sind. Möglicherweise spielt in unserem Sample die für 2009 und 2010 angeschaffte bewegliche Wirtschaftsgüter gewährte steuerliche degressive AfA eine Rolle. Jedoch dürfte dieser Effekt bei der ETR aufgrund der zu bildenden latenten Steuern eigentlich nicht zum Tragen kommen.

[80] In Schritt 3 haben wir Unternehmen aus dem Sample ausgeschlossen, deren Verluste bei Simulation von § 10d EStG im Betrachtungszeitraum nicht ausgeglichen werden können. D.h., im Regressionssample befinden sich nur noch Unternehmen, bei denen Verluste gemäß unserer Simulation von § 10d EStG innerhalb des Betrachtungszeitraums eigentlich hätten verrechnet werden können.

[81] Da aktive latente Steuern nicht eigens ausgewiesen werden müssen – und dies auch kaum geschieht –, sondern mit den passiven latenten Steuern saldiert werden dürfen, kann man hierfür nicht kontrollieren.

Unternehmensspezifische Nominalsteuersätze, genauer: die Abweichung aufgrund unterschiedlicher Gewerbesteuer-Hebesätze vom Mittelwert (NDIFF)[82] sind, wie erwartet, hoch signifikant positiv mit der ETR/CETR korreliert (Signifikanzniveau 1 %). Ein 1 Prozentpunkt höherer Nominalsteuersatz schlägt sich demnach in einer rund 0,78 Prozentpunkte höheren ETR/CETR nieder.

Die Tatsache, dass die (relative) Höhe der Beteiligungserträge (BE) keinen (statistisch signifikanten) Einfluss auf ETR/CETR ausübt, spricht dafür, dass unsere Annahme, 70 % des Beteiligungsergebnisses sind durch § 8b KStG (zu 95 %) steuerfrei gestellt, eine brauchbare Schätzung darstellt.

4.6 Fazit

Die im Titel des Beitrags aufgeworfene Frage „Steuerbelastung deutscher Kapitalgesellschaften von lediglich 20 % – Fakt oder Fake News?" lässt sich eindeutig beantworten. Es handelt sich um Fake News. Tatsächlich beträgt die Steuerbelastung deutscher Kapitalgesellschaften – gemessen an der ETR basierend auf handelsrechtlichen Einzelabschlüssen – im Mittel knapp 30 % und liegt damit um 10 Prozentpunkte bzw. 50 % über dem in der Grüne/EFA-Studie genannten Wert i.H.v. knapp 20 %. Somit entrichten deutsche Kapitalgesellschaften auf ihre im Inland erzielten Gewinne Steuern in Höhe des gesetzlichen Nominalsteuersatzes. Unsere Ergebnisse zeigen, dass für eine sachgerechte Analyse unternehmerischer ETRs zweierlei nötig ist: Zum einen müssen steuerrechtliche Besonderheiten, wie die Dividendenfreistellung nach § 8b KStG, Berücksichtigung finden. Zum anderen ist eine sorgfältige Datenaufbereitung notwendig. Andernfalls enhält der Datensatz Unternehmen, die vom Gesetzgeber bewusst von der Regelbesteuerung ausgenommen sind, z.B. gemeinnützige Unternehmen, oder Personengesellschaften, bei denen nur die Gewerbesteuer als Steueraufwand ausgewiesen ist.

Abschließend sei darauf hingewiesen, dass mit der Erkenntnis „deutsche Kapitalgesellschaften unterliegen mit ihren im Inland erzielten Gewinnen dem Nominalsteuersatz" nicht gesagt ist, es gäbe keinerlei Steuergestaltungen zu Lasten des deutschen Fiskus. Nur lassen sich derartige Steuergestaltungen nicht anhand von ETRs aus dem handelsrechtlichen Einzelabschluss identifizieren. Internationale Steuergestaltungen gehen in aller Regel einher mit sog. „conforming tax planning", bei dem der steuerliche und der handelsrechtliche Gewinn in gleicher Weise zu Lasten von Unternehmenseinheiten mit Sitz in einem Hochsteuerland gemindert werden, ohne dass die ETR dieser Unternehmenseinheit beeinflusst wird.[83] Als Beispiel seien Steuerplanungsaktivitäten über (steuerlich nicht beanstandete)

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[82] Lopes Dias und Gomes Reis (2018) kontrollieren ebenso für unterschiedliche Nominalsteuersätze in einem internationalen Sample.

[83] Vgl. Hanlon und Heitzman (2010, S. 137). Sie weisen darauf hin, dass die in der umfangreichen tax aggressivness Literatur verwendeten Maße in der Regel nur auf die sog. "non-conforming tax planning" abzielen.

Transferpreise oder Fremdfinanzierungen zu Lasten inländischer Konzerngesellschaften genannt. Werden solche Gewinnverschiebungen ins niedrig besteuernde Ausland steuerrechtlich korrigiert, als Beispiel sei eine Korrektur der Verrechnungspreise oder die Hinzurechnungsbesteuerung genannt, führt dies sogar zu einer über dem Nominalsteuersatz liegenden ETR.

A Tax Misperception and its Effect on Decision Making - Literature Review and Behavioral Taxpayer Response Model

Supplemental data for this article can be accessed on the Taylor & Francis website, https://www.tandfonline.com/doi/full/10.1080/09638180.2020.1852095.

Table A1. Tax Misperception

Table A2. Effect of Tax Misperception on Decision-Making

Table A3. Management of Tax Perception and its Impact on Stakeholders

B Firms' Tax Rate Misperception: Measurement, Drivers, and Distortionary Effects

B.1 Full Survey Questionnaire

Part I: Firm Characteristics

  1. What is the legal form of your firm?
2a. In which craft do you operate?
2b. In which industry do you work?
3a. Which chamber of handicrafts are you a member of?
3b. In which federal state is your firm registered?
  4. Does your firm belong to a group?
5a. How many people, that are subject to social insurance contributions, do you employ? Please state the exact number.
5b. Which interval does most likely correspond to the number of people you employ that are subject to social insurance contributions?
  6. Does your firm belong to a tax group?
  7. Which of the following intervals most accurately corresponds to your sales (in euros) in the 2019 financial year?
8a. Can you specify the number of shareholders involved in your firm?
8b. Which of the following intervals most closely matches the number of shareholders involved in your firm?
9a. Does your firm use the support of a tax advisor?
9b. Does your firm have its own tax department?

Part II: Income Taxation

  1. How high do you estimate the income tax burden (in %) if your firm were to achieve a domestic annual result before taxes in the amount of [profit] €?
  2. Assume that your firm can increase this annual profit before tax by [10% profit] € (10%). How high do you estimate the income tax burden (in %) on this additional [10% profit] €?
  3. What income tax burden (in %) do you feel would be appropriate if your firm were to achieve domestic annual earnings before taxes in the amount of [profit] €?

Part III: Comparison of Income Taxation

  1. How would you rate your firm's income tax burden compared to a smaller/bigger/firm of different legal form?
  2. How would you rate your firm's income tax burden compared to foreign competitors?

Part ÌV: Taxes in Business Decisions

1. Do you consider income taxes in investment/financing decisions?
2. Do you seek professional advice on tax aspects (e.g., from a tax advisor) when making investment/financing decisions?
3. Which tax rate do you use to make these business decisions?

Part V: Compliance Costs

1. Please estimate the share of the tax-related administrative burden in the total tax-related administrative expenses in your firm.

Part VI: Tax System

1. To what extent do you agree with the following statement? "German corporate taxation is too complex".
2. To what extent do you agree with the following statement? "The state handles the taxes it collects responsibly".

Part VII: Firm & Personal Characteristics

1. Has your [firm/group] generated profits in the financial year 2018/2019/2020?
2. Do you expect your [firm/group] to make a profit in the 2021 financial year?
3. What is the (weighted) local tax factor of your firm?
4. Please state your gender.
5. Do you have any tax knowledge?
6. Do you work in an executive position?

B.2 Variables

B.2.1 Variable Definition

TABLE B.1: Variable Definition

Name	Definition	Values
Firm Characteristics		
Employees	= Natural logarithm of the number of employees	metric
Corporation	= 1, if legal form is corporation, 0 otherwise	binary
Loss	= 1, if loss occured in 2019 or 2020, 0 otherwise	binary
Tax Assistance	= 1, if firm gets support from tax advisor, 0 otherwise	binary
Personal Characteristics		
Tax Knowledge Index	= Standardized index comprising indicator variables:	metric
Tax Knowledge	= 1, if respondent has tax knowledge, 0 otherwise	binary
Tax Schedule	= 1, if relation ATR to MTR accurate, 0 otherwise	binary
Tax Rate Choice	= 1, if using MTR in business decisions, 0 otherwise	binary
Business Decisions	= Frequency of using taxes in business decisions	metric
Tax Satisfaction Index	= Standardized index comprising indicator variables:	metric
Tax Cut	= Proposed tax cut	metric
Tax Complexity	= Perceived tax complexity	metric
Trust in Government	= Stated trust in government	metric
Tax Compliance Cost	= Estimated tax compliance costs	metric
Peers' Tax Burden	= Perception of peers' tax burden	metric
Female	= 1, if stated gender is female, 0 otherwise	binary
Manager	= 1, if respondent works in an executive position, 0 otherwise	binary
Misperception Characteristics		
Misperception Index	= Standardized index comprising indicator variables:	metric
ATR Misperception	= 1, if respondent misperceive $ATR_{retained}$ by > 5pp, 0 otherwise	binary
MTR Misperception	= 1, if respondent misperceive $MTR_{retained}$ by > 5pp, 0 otherwise	binary
Tax Schedule Misperception	= 1, if relation ATR to MTR misperceived, 0 otherwise	binary
Difference MTR - ATR	= Difference of $MTR_{perceived}$ - $ATR_{perceived}$	metric

Notes: This table presents definitions of drivers analyzed in our regression analysis.

B.2.2 Summary Statistics

TABLE B.2: Summary Statistics

Statistic	N	Mean	St. Dev.	Min	Median	Max
$\text{ATR}_{\text{retained}}$ Misp.	478	0.113	0.103	0.000	0.093	0.647
$\text{ATR}_{\text{distributed}}$ Misp.	478	0.126	0.105	0.000	0.111	0.647
$\text{MTR}_{\text{retained}}$ Misp.	478	0.102	0.108	0.00005	0.057	0.515
$\text{MTR}_{\text{distributed}}$ Misp.	478	0.113	0.113	0.0002	0.071	0.515
Employees	478	1.992	1.730	0.000	1.792	11.918
Corporation	478	0.264	0.441	0	0	1
Loss	478	0.184	0.388	0	0	1
Tax Assistance	478	0.906	0.292	0	1	1
Tax Knowledge Index	478	0.000	1.000	-2.381	-0.046	2.274
Tax Knowledge	478	0.000	1.000	-1.849	0.540	0.540
Tax Schedule	478	0.000	1.000	-1.138	0.877	0.877
Tax Rate Choice	478	0.000	1.000	-0.407	-0.407	2.453
Business Decisions	478	0.000	1.000	-1.865	0.400	1.154
Tax Satisfaction Index	478	0.000	1.000	-5.798	0.001	2.847
Tax Cut$_{\text{retained}}$	478	0.000	1.000	-9.510	0.251	2.188
Tax Cut$_{\text{distributed}}$	478	0.000	1.000	-9.509	0.156	6.062
Tax Complexity	478	0.000	1.000	-0.497	-0.497	5.441
Trust	478	0.000	1.000	-0.882	0.216	3.511
Tax Compliance Cost	478	0.000	1.000	-3.208	0.145	1.583
Peers' Tax Burden	478	0.000	1.000	-2.129	-0.178	1.774
Female	478	0.180	0.385	0	0	1
Manager	478	0.977	0.150	0	1	1
Misperception Index	478	1.623	1.003	0	2	3
$\text{ATR}_{\text{retained}}$ Misperception	478	0.644	0.479	0	1	1
$\text{MTR}_{\text{retained}}$ Misperception	478	0.544	0.499	0	1	1
Tax Schedule Misperception	478	0.435	0.496	0	0	1

Notes: This table presents summary statistics of our regression variables incl. standardized variables (z-score) incorporated in Tax Knowledge and Tax Satisfaction index.

B.3 Propensity Score Matching

In order to account for tax base effects, we match survey respondents with 10 observations from the official income tax statistics (FAST 2014, see Section 2.3.2). We are interested in *Additional Income* and *Special Expenses* of comparable entrepreneurs. For this reason, we limit FAST 2014 to a weighted sample of 2,438,306 entrepreneurs, which forms the basis for matching.

After propensity score matching we can check the balance of our covariates in Table B.3.

TABLE B.3: Summary of Balance for Matched Data

	FAST 2014 N = 7,442	**Survey** N = 748
Profit		
Mean (SD)	87,200 (91,200)	90,300 (103,000)
Median [Min, Max]	60,100 [16,900; 10,300,000]	62,600 [17,800; 10,400,000]
Industry		
BC	1,741 (23.4%)	176 (23.5%)
DE	20 (0.3%)	2 (0.3%)
F	3,382 (45.4%)	340 (45.5%)
G	800 (10.7%)	80 (10.7%)
I	20 (0.3%)	2 (0.3%)
J	20 (0.3%)	2 (0.3%)
K	40 (0.5%)	4 (0.5%)
L	40 (0.5%)	4 (0.5%)
M	160 (2.2%)	26 (2.1%)
N	20 (0.3%)	2 (0.3%)
Q	20 (0.3%)	2 (0.3%)
S	1,179 (15.8%)	118 (15.8%)
Legal		
Sole Proprietorship	5,400 (72.6%)	540 (72.2%)
Partnership	2,042 (27.4%)	208 (27.8%)
Married		
Single	3,711 (49.9%)	374 (50.0%)
Married	3,731 (50.1%)	374 (50.0%)

Notes: This table shows matched data of FAST 2014 and Survey observations. Industry is the 'Gewerbekennzahl' given in the official income tax statistics and can be derived from the industry asked in our Survey. The number of observations (N = 748) represents twice of our matchable sole proprietorships and partnerships because we used them as both single and married taxpayers to account for the unknown marital status.

B.4 Additional Analysis

B.4.1 Corridor Sensitivity

In Section 2.4.1 we define firms as misperceiving if they exceed the selected corridor of ± 5 or ± 10pp. We chose ± 5 (± 10)pp corridors because these result into quite large deviations of more than 15% (30%) given average tax rates of 30%. To be transparent we show in Figure B.1 how the chosen corridor affects the share of firms misperceiving their tax burden.

FIGURE B.1: Corridor Sensitivity
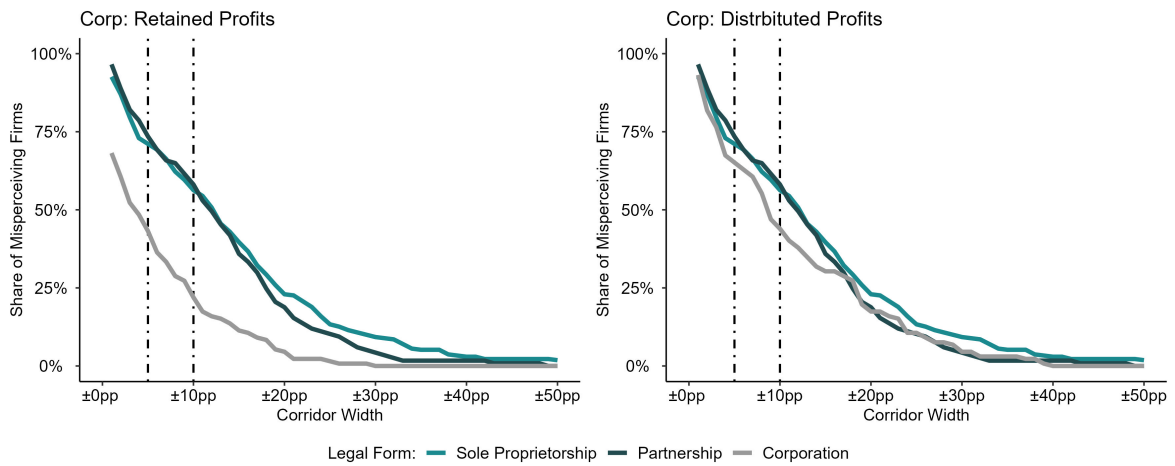
Notes: This figure shows the average share of ATR misperceiving firms on defined corridors by legal form. Corporations in case of retained profits. The dot-dashed lines indicate the corridors used within the paper.

B.4.2 Correlation of Covariates

TABLE B.4: Correlation Matrix of Covariates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Employees	1	0.410	0.012	-0.284	0.131	0.094	-0.085	0.012
(2) Corporation	0.410	1	0.059	-0.051	0.027	0.142	-0.095	0.028
(3) Loss	0.012	0.059	1	-0.050	-0.042	-0.119	0.002	0.001
(4) Tax Assistance	-0.284	-0.051	-0.050	1	-0.122	-0.068	0.002	0.046
(5) Tax Satisfaction Index	0.131	0.027	-0.042	-0.122	1	-0.038	0.006	-0.031
(6) Tax Knowledge Index	0.094	0.142	-0.119	-0.068	-0.038	1	0.075	-0.019
(7) Female	-0.085	-0.095	0.002	0.002	0.006	0.075	1	-0.182
(8) Manager	0.012	0.028	0.001	0.046	-0.031	-0.019	-0.182	1

Notes: This table presents a correlation matrix of variables used in the regression analyses. The variance inflation factor does not indicate any problems regarding multicollinearity.

B.4.3 Summary Statistics by Legal Form

We additionally provide summary statistics of variables used in our regressions for sole proprietorships and partnerships as well as for corporations.

TABLE B.5: Summary Statistics (Sole Proprietorships and Partnerships)

Statistic	N	Mean	St. Dev.	Min	Median	Max
$ATR_{retained}$ Misp.	352	0.132	0.107	0.000	0.121	0.647
$ATR_{distributed}$ Misp.	352	0.132	0.107	0.000	0.121	0.647
$MTR_{retained}$ Misp.	352	0.109	0.112	0.0002	0.064	0.515
$MTR_{distributed}$ Misp.	352	0.109	0.112	0.0002	0.064	0.515
Employees	352	1.568	1.526	0.000	1.386	10.597
Corporation	352	0.000	0.000	0	0	0
Loss	352	0.170	0.377	0	0	1
Tax Assistance	352	0.915	0.280	0	1	1
Tax Satisfaction Index	352	−0.016	0.994	−5.619	−0.012	2.847
Tax Knowledge Index	352	−0.085	1.018	−2.381	−0.102	2.274
Female	352	0.202	0.402	0	0	1
Manager	352	0.974	0.158	0	1	1
Misperception Index	352	1.793	0.864	0	2	3

Notes: This table presents summary statistics of our variables used in the regression analyses. The number of observations differs to the presented final sample due to missing answers of covariates.

TABLE B.6: Summary Statistics (Corporations)

Statistic	N	Mean	St. Dev.	Min	Median	Max
$ATR_{retained}$ Misp.	126	0.059	0.065	0.00005	0.037	0.295
$ATR_{distributed}$ Misp.	126	0.111	0.097	0.001	0.083	0.393
$MTR_{retained}$ Misp.	126	0.080	0.090	0.00005	0.045	0.502
$MTR_{distributed}$ Misp.	126	0.123	0.114	0.003	0.097	0.463
Employees	126	3.176	1.721	0.693	2.890	11.918
Corporation	126	1.000	0.000	1	1	1
Loss	126	0.222	0.417	0	0	1
Tax Assistance	126	0.881	0.325	0	1	1
Tax Satisfaction Index	126	0.045	1.019	−5.798	0.052	2.468
Tax Knowledge Index	126	0.237	0.910	−1.697	0.296	2.274
Female	126	0.119	0.325	0	0	1
Manager	126	0.984	0.125	0	1	1
Misperception Index	126	1.151	1.200	0	1	3

Notes: This table presents summary statistics of our variables used in the regression analyses. The number of observations differs to the presented final sample due to missing answers of covariates.

B.5   Robustness Checks

The identification of firms' tax rate misperception is based on assumptions. We want to ensure that these assumptions do not erroneously inflate or deflate our baseline results. For this purpose, we check following different approaches and methods:

1. Samples
2. Identification of Tax Misperception
3. Method

B.5.1 Samples

Ex. Implausible MTRs

Comparing ATRs and MTRs, we find firms that report single digit MTRs although they report double digit ATRs. It may be that these firms did not understand the question about the marginal tax rate. Therefore, we perform additional analyses for subsamples excluding these "implausible MTR" firms. The regression results remain similar.

TABLE B.7: OLS Regression of ATR and MTR Misperception

	Dependent variable:			
	$ATR_{retained}$	$MTR_{retained}$	$ATR_{distributed}$	$MTR_{distributed}$
	(1)	(2)	(3)	(4)
Employees	−0.005	0.005	−0.005	0.005
	(0.005)	(0.004)	(0.005)	(0.004)
Corporation	−0.067***	0.029	−0.042	0.034
	(0.022)	(0.022)	(0.028)	(0.026)
Employees x Corporation	0.002	−0.015*	0.010	−0.003
	(0.008)	(0.008)	(0.010)	(0.009)
Loss	0.013	0.011	0.007	0.001
	(0.014)	(0.012)	(0.015)	(0.013)
Tax Assistance	0.004	−0.007	0.0002	−0.006
	(0.015)	(0.013)	(0.018)	(0.014)
Tax Knowledge Index	−0.015***	−0.018***	−0.019***	−0.021***
	(0.004)	(0.004)	(0.004)	(0.004)
Tax Satisfaction Index	−0.030***	−0.014**	−0.028***	−0.009*
	(0.007)	(0.005)	(0.007)	(0.005)
Female	−0.009	−0.012	−0.002	−0.005
	(0.011)	(0.010)	(0.012)	(0.011)
Manager	0.005	0.022	−0.018	0.002
	(0.018)	(0.025)	(0.032)	(0.038)
Constant	0.133***	0.068**	0.158***	0.087**
	(0.022)	(0.027)	(0.034)	(0.038)
Observations	445	445	445	445
R^2	0.218	0.087	0.113	0.070
Adjusted R^2	0.202	0.068	0.095	0.051

Notes: This table shows the OLS regression results of ATR and MTR misperception. The dependent variables in columns (1) and (2) represent the case where corporations report their ATR and MTR on retained profits, and the dependent variables in columns (3) and (4) represent the case where corporations report their ATR and MTR on distributed profits. All variables are defined in more detail in the Appendix A2. Robust standard errors are in parentheses. * $p < .1$, ** $p < .05$, *** $p < .01$.

TABLE B.8: OLS Regression of ATR and MTR Over-/Underestimation

	$\text{ATR}_{\text{retained}}$		$\text{MTR}_{\text{retained}}$		$\text{ATR}_{\text{distributed}}$		$\text{MTR}_{\text{distributed}}$	
	Over	Under	Over	Under	Over	Under	Over	Under
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Employees	−0.018***	0.020***	−0.013***	0.012**	−0.018***	0.020***	−0.013***	0.013**
	(0.004)	(0.007)	(0.005)	(0.005)	(0.004)	(0.007)	(0.005)	(0.005)
Corporation	−0.096***	0.052*	0.034	−0.011	−0.100***	0.105***	0.013	0.047
	(0.020)	(0.029)	(0.022)	(0.027)	(0.031)	(0.033)	(0.033)	(0.030)
Employees x Corporation	0.013**	−0.022**	−0.002	−0.011	0.021**	−0.016	0.008	−0.007
	(0.006)	(0.010)	(0.007)	(0.009)	(0.008)	(0.011)	(0.008)	(0.010)
Loss	0.034**	0.009	0.030*	−0.017	0.026	−0.001	0.008	−0.020
	(0.016)	(0.014)	(0.017)	(0.016)	(0.018)	(0.018)	(0.019)	(0.016)
Tax Assistance	0.032**	−0.011	0.012	−0.010	0.023	0.001	0.0004	0.007
	(0.013)	(0.021)	(0.015)	(0.016)	(0.014)	(0.030)	(0.017)	(0.017)
Tax Knowledge Index	−0.010**	−0.018***	−0.004	−0.029***	−0.012**	−0.023***	−0.002	−0.033***
	(0.004)	(0.006)	(0.004)	(0.006)	(0.005)	(0.009)	(0.005)	(0.006)
Tax Satisfaction Index	−0.040***	0.013*	−0.032***	0.002	−0.046***	0.017**	−0.032***	0.005
	(0.008)	(0.007)	(0.006)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)
Female	−0.018	0.030*	−0.021*	0.004	−0.013	0.022	−0.010	0.001
	(0.013)	(0.018)	(0.012)	(0.016)	(0.013)	(0.022)	(0.012)	(0.017)
Manager	0.016	−0.042**	0.010	0.029	0.006	−0.202***	−0.008	0.002
	(0.015)	(0.021)	(0.024)	(0.033)	(0.019)	(0.029)	(0.043)	(0.051)
Constant	0.121***	0.052	0.070**	0.060*	0.139***	0.202***	0.101**	0.069
	(0.019)	(0.037)	(0.029)	(0.035)	(0.024)	(0.052)	(0.046)	(0.050)
Observations	351	94	244	201	320	125	218	227
R^2	0.330	0.368	0.217	0.175	0.285	0.315	0.160	0.161
Adjusted R^2	0.313	0.300	0.186	0.136	0.264	0.261	0.124	0.126

Notes: This table shows OLS regression results of ATR and MTR misperception, which is divided into overestimation and underestimation. The dependent variables in columns (1)-(4) represent the case where corporations report their ATR and MTR on retained profits, and the dependent variables in columns (5)-(8) represent the case where corporations report their ATR and MTR on distributed profits. Note, that underestimates like overestimates have a positive sign. All variables are defined in more detail in the Appendix A2. Robust standard errors are in parentheses. * $p < .1$, ** $p < .05$, *** $p < .01$.

Ex. Fast Respondents

In line with Fisman et al. (2020) and Stantcheva (2021), we drop very fast respondents in this additional analysis. We drop respondents in the bottom 5% of the survey time distribution. These respondents may not have taken the survey seriously. The regression results remain similar.

TABLE B.9: OLS Regression of ATR and MTR Misperception

	Dependent variable:			
	$\text{ATR}_{\text{retained}}$	$\text{MTR}_{\text{retained}}$	$\text{ATR}_{\text{distributed}}$	$\text{MTR}_{\text{distributed}}$
	(1)	(2)	(3)	(4)
Employees	−0.005	0.010**	−0.005	0.010**
	(0.005)	(0.004)	(0.005)	(0.004)
Corporation	−0.064***	0.031	−0.044	0.041
	(0.021)	(0.022)	(0.027)	(0.029)
Employees x Corporation	0.002	−0.020***	0.011	−0.010
	(0.008)	(0.008)	(0.010)	(0.009)
Loss	0.016	0.014	0.011	0.004
	(0.013)	(0.014)	(0.014)	(0.015)
Tax Assistance	−0.001	0.002	−0.002	0.001
	(0.016)	(0.016)	(0.017)	(0.016)
Tax Knowledge Index	−0.013***	−0.029***	−0.018***	−0.034***
	(0.004)	(0.004)	(0.004)	(0.005)
Tax Satisfaction Index	−0.028***	−0.015***	−0.027***	−0.012**
	(0.007)	(0.005)	(0.007)	(0.005)
Female	−0.012	−0.003	0.0003	0.006
	(0.011)	(0.012)	(0.012)	(0.013)
Manager	0.004	0.019	−0.015	0.003
	(0.017)	(0.029)	(0.030)	(0.038)
Constant	0.134***	0.069**	0.151***	0.085**
	(0.022)	(0.032)	(0.032)	(0.039)
Observations	454	454	454	454
R^2	0.202	0.128	0.116	0.105
Adjusted R^2	0.186	0.110	0.098	0.087

Notes: This table shows the OLS regression results of ATR and MTR misperception. The dependent variables in columns (1) and (2) represent the case where corporations report their ATR and MTR on retained profits, and the dependent variables in columns (3) and (4) represent the case where corporations report their ATR and MTR on distributed profits. All variables are defined in more detail in the Appendix A2. Robust standard errors are in parentheses. * p < .1, ** p < .05, *** p < .01.

TABLE B.10: OLS Regression of ATR and MTR Over-/Underestimation

	Dependent variable:							
	$\text{ATR}_{\text{retained}}$		$\text{MTR}_{\text{retained}}$		$\text{ATR}_{\text{distributed}}$		$\text{MTR}_{\text{distributed}}$	
	Over	Under	Over	Under	Over	Under	Over	Under
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Employees	−0.020***	0.021***	−0.010**	0.016***	−0.020***	0.022***	−0.011**	0.016***
	(0.004)	(0.007)	(0.004)	(0.006)	(0.004)	(0.007)	(0.004)	(0.006)
Corporation	−0.092***	0.051*	0.039*	−0.016	−0.093***	0.093***	0.022	0.041
	(0.019)	(0.029)	(0.022)	(0.031)	(0.030)	(0.031)	(0.033)	(0.035)
Employees x Corporation	0.014**	−0.023**	−0.003	−0.017	0.021***	−0.016	0.005	−0.013
	(0.006)	(0.010)	(0.006)	(0.011)	(0.008)	(0.011)	(0.008)	(0.011)
Loss	0.033**	0.016	0.029	−0.009	0.025	0.009	0.005	−0.014
	(0.015)	(0.014)	(0.017)	(0.021)	(0.017)	(0.017)	(0.020)	(0.020)
Tax Assistance	0.024*	−0.008	0.026	−0.001	0.013	0.019	0.009	0.017
	(0.014)	(0.021)	(0.017)	(0.023)	(0.015)	(0.020)	(0.018)	(0.022)
Tax Knowledge Index	−0.008*	−0.015**	−0.007	−0.043***	−0.011**	−0.024***	−0.004	−0.048***
	(0.004)	(0.006)	(0.004)	(0.007)	(0.005)	(0.008)	(0.005)	(0.007)
Tax Satisfaction Index	−0.037***	0.013**	−0.031***	−0.007	−0.041***	0.013*	−0.030***	−0.006
	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.007)	(0.007)
Female	−0.019	0.021	−0.019	0.016	−0.012	0.031	−0.007	0.016
	(0.013)	(0.018)	(0.012)	(0.020)	(0.013)	(0.021)	(0.013)	(0.020)
Manager	0.015	−0.055***	0.008	0.020	0.007	−0.203***	−0.009	−0.003
	(0.014)	(0.021)	(0.022)	(0.040)	(0.019)	(0.028)	(0.043)	(0.049)
Constant	0.127***	0.062*	0.053*	0.081*	0.143***	0.180***	0.087*	0.086*
	(0.020)	(0.035)	(0.028)	(0.044)	(0.024)	(0.043)	(0.046)	(0.051)
Observations	362	92	232	222	330	124	208	246
R^2	0.305	0.369	0.217	0.198	0.261	0.330	0.152	0.169
Adjusted R^2	0.288	0.300	0.185	0.164	0.241	0.278	0.113	0.137

Notes: This table shows OLS regression results of ATR and MTR misperception, which is divided into overestimation and underestimation. The dependent variables in columns (1)-(4) represent the case where corporations report their ATR and MTR on retained profits, and the dependent variables in columns (5)-(8) represent the case where corporations report their ATR and MTR on distributed profits. Note, that underestimates like overestimates have a positive sign. All variables are defined in more detail in the Appendix A2. Robust standard errors are in parentheses. * $p < .1$, ** $p < .05$, *** $p < .01$.

B.5.2   Identification of Tax Rate Misperception

Profit as Taxable Income

In this Section, we alternatively compute ATR and MTR Misperception for the case where *given profit* is used as taxable income. This reflects the idea that respondents do not necessarily consider the impact of *Additional Income* or *Special Expenses* on the tax base (see Section 2.3.2). Comparing these results to ATR and MTR Misperception based taxable income the share of misperception varies only slightly. There is no qualitative variation.

TABLE B.11: ATR MTR Misperception (Profit)

	Sole Proprietorships N = 270	Partnerships N = 117	Corporations N = 132	
			retained	*distributed*
Reported ATR	32.7%	36.9%	31.4%	43.3%
Actual ATR	24.1%	32.9%	29.8%	48.3%
ATR Misperception Share >5pp (>10pp)	**8.6pp***** 59.6% (40%)	**4pp***** 68.4% (47.9%)	**1.6pp**** 43.2% (22%)	**-5pp***** 65.2% (43.9%)
ATR Overestimation Share >5pp (>10pp)	12.5pp 55.9% (38.1%)	10.3pp 50.4% (33.3%)	5.9pp 28% (13.6%)	8.7pp 19.7% (11.4%)
ATR Underestimation Share >5pp (>10pp)	-3.8pp 3.7% (1.9%)	-13.4pp 17.9% (14.5%)	-5.8pp 15.2% (8.3%)	-12.8pp 45.5% (32.6%)
Reported MTR	31.3%	36.6%	31.9%	43.3%
Actual MTR	34.1%	42.1%	29.8%	48.3%
MTR Misperception Share >5pp (>10pp)	**-3.7pp***** 56.7% (39.3%)	**-5.2pp***** 53% (37.6%)	**2.1pp**** 46.2% (29.5%)	**-5pp***** 46.2% (49.2%)
MTR Overestimation Share >5pp (>10pp)	9pp 19.6% (12.2%)	5.7pp 21.4% (9.4%)	8.2pp 31.1% (18.2%)	9.4pp 19.7% (14.4%)
MTR Underestimation Share >5pp (>10pp)	-12.8pp 37% (27%)	-15.9pp 31.6% (28.2%)	-7.5pp 15.2% (11.4%)	-14.4pp 44.7% (34.8%)

Notes: This table shows descriptive evidence of ATR and MTR Misperception. Reported ATR/MTR is the mean value of reported ATRs by legal form. Actual ATRs/MTRs are calculated benchmark ATRs. ATR/MTR Misperception is calculated as Reported ATR/MTR minus Actual ATR/MTR. ***, **, and * denote significance at the 1%, 5%, and 10% levels of a two-sided t-test (ATR/MTR Misperception = 0). ATR/MTR Overestimation measures the average ATR/MTR Misperception in case of positive deviations, and ATR/MTR Underestimation measures the average ATR/MTR Misperception in case of negative deviations. Share >5pp (>10pp) gives the share of all firms that misperceive, overestimate, or underestimate the Actual ATR/MTR by more than ±5pp (±10pp).

TABLE B.12: OLS Regression of ATR and MTR Misperception (Profit)

	Dependent variable:			
	ATR$_{retained}$	MTR$_{retained}$	ATR$_{distributed}$	MTR$_{distributed}$
	(1)	(2)	(3)	(4)
Employees	−0.0001	0.009**	−0.0002	0.009**
	(0.005)	(0.004)	(0.005)	(0.004)
Corporation	−0.028	0.032	0.001	0.048*
	(0.020)	(0.022)	(0.026)	(0.028)
Employees x Corporation	−0.004	−0.020***	0.004	−0.010
	(0.008)	(0.007)	(0.009)	(0.009)
Loss	0.022*	0.016	0.015	0.005
	(0.012)	(0.013)	(0.013)	(0.014)
Tax Assistance	0.002	0.002	−0.002	0.001
	(0.014)	(0.015)	(0.017)	(0.015)
Tax Knowledge Index	−0.011***	−0.028***	−0.016***	−0.032***
	(0.004)	(0.004)	(0.004)	(0.005)
Tax Satisfaction Index	−0.021***	−0.013**	−0.020***	−0.009*
	(0.006)	(0.005)	(0.006)	(0.005)
Female	−0.012	−0.007	−0.003	0.001
	(0.010)	(0.011)	(0.011)	(0.012)
Manager	0.021	0.008	0.003	−0.008
	(0.018)	(0.029)	(0.031)	(0.037)
Constant	0.077***	0.077**	0.098***	0.094**
	(0.021)	(0.031)	(0.033)	(0.039)
Observations	478	478	478	478
R^2	0.139	0.121	0.077	0.102
Adjusted R^2	0.122	0.104	0.059	0.085

Notes: This table shows the OLS regression results of ATR and MTR misperception. The dependent variables in columns (1) and (2) represent the case where corporations report their ATR and MTR on retained profits, and the dependent variables in columns (3) and (4) represent the case where corporations report their ATR and MTR on distributed profits. All variables are defined in more detail in the Appendix A2. Robust standard errors are in parentheses. * $p < .1$, ** $p < .05$, *** $p < .01$.

TABLE B.13: OLS Regression of ATR and MTR Over-/Underestimation (Profit)

	Dependent variable:							
	$\text{ATR}_{\text{retained}}$		$\text{MTR}_{\text{retained}}$		$\text{ATR}_{\text{distributed}}$		$\text{MTR}_{\text{distributed}}$	
	Over	Under	Over	Under	Over	Under	Over	Under
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Employees	−0.018***	0.021***	−0.010**	0.015***	−0.014***	0.021***	−0.010**	0.016***
	(0.004)	(0.006)	(0.005)	(0.005)	(0.004)	(0.006)	(0.005)	(0.005)
Corporation	−0.063***	0.049**	0.048**	−0.015	−0.048*	0.108***	0.028	0.048
	(0.018)	(0.025)	(0.023)	(0.030)	(0.029)	(0.030)	(0.033)	(0.033)
Employees x Corporation	0.012**	−0.023**	−0.006	−0.017	0.015**	−0.018*	0.003	−0.013
	(0.006)	(0.009)	(0.007)	(0.010)	(0.008)	(0.010)	(0.008)	(0.011)
Loss	0.030**	0.012	0.022	0.003	0.029*	−0.0002	−0.001	−0.004
	(0.014)	(0.014)	(0.016)	(0.019)	(0.015)	(0.016)	(0.018)	(0.018)
Tax Assistance	0.032**	−0.017	0.007	0.012	0.020	−0.007	−0.009	0.022
	(0.014)	(0.018)	(0.015)	(0.020)	(0.014)	(0.026)	(0.015)	(0.020)
Tax Knowledge Index	−0.004	−0.015***	−0.003	−0.042***	−0.007	−0.022***	−0.001	−0.047***
	(0.004)	(0.004)	(0.004)	(0.006)	(0.004)	(0.006)	(0.005)	(0.006)
Tax Satisfaction Index	−0.027***	0.013**	−0.030***	−0.005	−0.035***	0.016**	−0.031***	−0.004
	(0.007)	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)	(0.006)
Female	−0.021*	0.014	−0.023**	0.018	−0.013	0.019	−0.014	0.016
	(0.012)	(0.015)	(0.011)	(0.018)	(0.012)	(0.018)	(0.012)	(0.019)
Manager	0.032**	−0.035	−0.010	0.023	0.021	−0.113	−0.036	0.003
	(0.015)	(0.025)	(0.023)	(0.038)	(0.019)	(0.071)	(0.046)	(0.045)
Constant	0.072***	0.058*	0.086***	0.061	0.081***	0.124	0.128**	0.071
	(0.020)	(0.033)	(0.031)	(0.040)	(0.023)	(0.079)	(0.051)	(0.045)
Observations	350	128	238	240	347	161	212	266
R^2	0.250	0.370	0.197	0.215	0.219	0.344	0.149	0.185
Adjusted R^2	0.230	0.322	0.166	0.184	0.198	0.305	0.111	0.157

Notes: This table shows OLS regression results of ATR and MTR misperception, which is divided into overestimation and underestimation. The dependent variables in columns (1)-(4) represent the case where corporations report their ATR and MTR on retained profits, and the dependent variables in columns (5)-(8) represent the case where corporations report their ATR and MTR on distributed profits. Note, that underestimates like overestimates have a positive sign. All variables are defined in more detail in the Appendix A2. Robust standard errors are in parentheses. * $p < .1$, ** $p < .05$, *** $p < .01$.

Total Income as Taxable Income

In this Section, we alternatively compute ATR and MTR Misperception for the case where total income is used as taxable income. This reflects the idea that respondents do consider other *Additional Income* but not *Special Expenses* (see Section 2.3.2). Comparing these results to ATR and MTR Misperception based taxable income the share of misperception varies only slightly. There is no qualitative variation.

TABLE B.14: ATR and MTR Misperception (Total Income)

	Sole Proprietorships N = 270	Partnerships N = 117	Corporations N = 132	
			retained	*distributed*
Reported ATR	32.7%	36.9%	31.4%	43.3%
Actual ATR	24.7%	33.6%	29.8%	48.3%
ATR Misperception Share >5pp (>10pp)	**8.1pp*** 63% (41.1%)	**3.3pp** 64.1% (47.9%)	**1.6pp** 43.2% (22%)	**-5pp*** 65.2% (43.9%)
ATR Overestimation Share >5pp (>10pp)	12.5pp 55.2% (37.8%)	9.4pp 46.2% (30.8%)	5.9pp 28% (13.6%)	8.7pp 19.7% (11.4%)
ATR Underestimation Share >5pp (>10pp)	-4.8pp 7.8% (3.3%)	-14.4pp 17.9% (17.1%)	-5.8pp 15.2% (8.3%)	-12.8pp 45.5% (32.6%)
Reported MTR	31.3%	36.6%	31.9%	43.3%
Actual MTR	34.1%	42.1%	29.8%	48.3%
MTR Misperception Share >5pp (>10pp)	**-5.3pp*** 62.2% (44.1%)	**-6.4pp*** 58.1% (38.5%)	**2.1pp** 46.2% (29.5%)	**-5pp*** 46.2% (49.2%)
MTR Overestimation Share >5pp (>10pp)	9.4pp 19.6% (12.2%)	5.5pp 21.4% (8.5%)	8.2pp 31.1% (18.2%)	9.4pp 19.7% (14.4%)
MTR Underestimation Share >5pp (>10pp)	-14.8pp 42.6% (31.9%)	-16.5pp 36.8% (29.9%)	-7.5pp 15.2% (11.4%)	-14.4pp 44.7% (34.8%)

Notes: This table shows descriptive evidence of ATR and MTR Misperception. Reported ATR/MTR is the mean value of reported ATRs by legal form. Actual ATRs/MTRs are calculated benchmark ATRs. ATR/MTR Misperception is calculated as Reported ATR/MTR minus Actual ATR/MTR. ***, **, and * denote significance at the 1%, 5%, and 10% levels of a two-sided t-test (ATR/MTR Misperception = 0). ATR/MTR Overestimation measures the average ATR/MTR Misperception in case of positive deviations, and ATR/MTR Underestimation measures the average ATR/MTR Misperception in case of negative deviations. Share >5pp (>10pp) gives the share of all firms that misperceive, overestimate, or underestimate the Actual ATR/MTR by more than ±5pp (±10pp).

TABLE B.15: OLS Regression of ATR and MTR Misperception (Total Income)

	Dependent variable:			
	$\text{ATR}_{\text{retained}}$	$\text{MTR}_{\text{retained}}$	$\text{ATR}_{\text{distributed}}$	$\text{MTR}_{\text{distributed}}$
	(1)	(2)	(3)	(4)
Employees	0.0001	0.006	−0.001	0.006
	(0.005)	(0.004)	(0.005)	(0.004)
Corporation	−0.027	0.017	−0.008	0.033
	(0.020)	(0.022)	(0.026)	(0.028)
Employees x Corporation	−0.004	−0.017**	0.004	−0.008
	(0.008)	(0.007)	(0.009)	(0.009)
Loss	0.022*	0.017	0.021*	0.007
	(0.012)	(0.014)	(0.013)	(0.014)
Tax Assistance	0.003	−0.005	−0.001	−0.006
	(0.014)	(0.016)	(0.016)	(0.016)
Tax Knowledge Index	−0.011***	−0.031***	−0.017***	−0.036***
	(0.004)	(0.004)	(0.004)	(0.005)
Tax Satisfaction Index	−0.021***	−0.012**	−0.016***	−0.009
	(0.006)	(0.005)	(0.006)	(0.005)
Female	−0.012	−0.005	−0.002	0.003
	(0.010)	(0.012)	(0.011)	(0.013)
Manager	0.021	0.016	0.013	−0.0003
	(0.018)	(0.032)	(0.032)	(0.040)
Constant	0.074***	0.092***	0.096***	0.109***
	(0.022)	(0.034)	(0.034)	(0.041)
Observations	478	478	478	478
R^2	0.135	0.132	0.072	0.103
Adjusted R^2	0.118	0.115	0.054	0.086

Notes: This table shows the OLS regression results of ATR and MTR misperception. The dependent variables in columns (1) and (2) represent the case where corporations report their ATR and MTR on retained profits, and the dependent variables in columns (3) and (4) represent the case where corporations report their ATR and MTR on distributed profits. All variables are defined in more detail in the Appendix A2. Robust standard errors are in parentheses. * $p < .1$, ** $p < .05$, *** $p < .01$.

TABLE B.16: OLS Regression of ATR and MTR Over-/Underestimation (Total Income)

	ATR$_{retained}$		MTR$_{retained}$		ATR$_{distributed}$		MTR$_{distributed}$	
	Over	Under	Over	Under	Over	Under	Over	Under
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Employees	−0.018***	0.021***	−0.011**	0.012**	−0.017***	0.015***	−0.011**	0.013**
	(0.004)	(0.006)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)
Corporation	−0.060***	0.038	0.048**	−0.035	−0.065**	0.066**	0.026	0.029
	(0.018)	(0.025)	(0.023)	(0.029)	(0.029)	(0.029)	(0.033)	(0.033)
Employees x Corporation	0.012**	−0.022**	−0.005	−0.014	0.018**	−0.011	0.004	−0.010
	(0.006)	(0.009)	(0.007)	(0.010)	(0.008)	(0.010)	(0.008)	(0.011)
Loss	0.033**	0.022	0.021	0.014	0.039**	0.005	−0.002	0.006
	(0.014)	(0.015)	(0.016)	(0.019)	(0.017)	(0.015)	(0.018)	(0.019)
Tax Assistance	0.028*	−0.004	0.002	0.004	0.017	0.0001	−0.017	0.015
	(0.015)	(0.019)	(0.015)	(0.021)	(0.016)	(0.022)	(0.015)	(0.021)
Tax Knowledge Index	−0.003	−0.021***	−0.006	−0.044***	−0.005	−0.027***	−0.003	−0.048***
	(0.004)	(0.005)	(0.004)	(0.006)	(0.005)	(0.006)	(0.005)	(0.007)
Tax Satisfaction Index	−0.030***	0.009	−0.031***	−0.008	−0.031***	0.014**	−0.031***	−0.007
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)
Female	−0.023*	0.020	−0.025**	0.017	−0.016	0.020	−0.015	0.014
	(0.012)	(0.017)	(0.012)	(0.019)	(0.014)	(0.017)	(0.013)	(0.019)
Manager	0.031**	−0.031	−0.001	0.006	0.034	−0.096	−0.027	−0.018
	(0.015)	(0.023)	(0.021)	(0.043)	(0.023)	(0.077)	(0.039)	(0.050)
Constant	0.075***	0.048	0.085***	0.103**	0.089***	0.142*	0.130***	0.116**
	(0.021)	(0.034)	(0.029)	(0.045)	(0.027)	(0.082)	(0.044)	(0.051)
Observations	348	130	225	253	287	191	199	279
R^2	0.260	0.342	0.202	0.211	0.229	0.228	0.148	0.169
Adjusted R^2	0.240	0.293	0.168	0.182	0.204	0.190	0.108	0.141

Notes: This table shows OLS regression results of ATR and MTR misperception, which is divided into overestimation and underestimation. The dependent variables in columns (1)-(4) represent the case where corporations report their ATR and MTR on retained profits, and the dependent variables in columns (5)-(8) represent the case where corporations report their ATR and MTR on distributed profits. Note, that underestimates like overestimates have a positive sign. All variables are defined in more detail in the Appendix A2. Robust standard errors are in parentheses. * $p < .1$, ** $p < .05$, *** $p < .01$.

Robust Misperception

In this Section, we alternatively compute ATR and MTR Misperception based on taxable income but allow for additional errors of ±2pp. This reflects the idea that by introducing a *given profit* plus adding average *Additional Income* and *Special Expenses* might induce computational errors (see Section 2.3.2). Comparing these results to ATR and MTR Misperception based taxable income the share of misperception varies only slightly. There is no qualitative variation.

TABLE B.17: ATR and MTR Misperception (Robust)

	Sole Proprietorships N = 270	Partnerships N = 117	Corporations N = 132	
			retained	*distributed*
Reported ATR	32.7%	36.9%	31.4%	43.3%
Actual ATR	19.7%	30.9%	29.8%	48.3%
ATR Misperception Share >5pp (>10pp)	**11.6pp*** 66.3% (50.7%)	**5.2pp*** 65.8% (49.6%)	**1.2pp*** 33.3% (15.9%)	**-4.5pp*** 60.6% (37.9%)
ATR Overestimation Share >5pp (>10pp)	15pp 63.3% (49.6%)	11.8pp 50.4% (36.8%)	7pp 19.7% (8.3%)	9.1pp 18.2% (7.6%)
ATR Underestimation Share >5pp (>10pp)	-4.2pp 3% (1.1%)	-13pp 15.4% (12.8%)	-7.8pp 13.6% (7.6%)	-12.8pp 13.6% (30.3%)
Reported MTR	31.3%	36.6%	31.9%	43.3%
Actual MTR	34.1%	42.1%	29.8%	48.3%
MTR Misperception Share >5pp (<10pp)	**-2.6pp*** 48.1% (35.9%)	**-5.4pp*** 46.2% (34.2%)	**1.7pp*** 40.9% (25.8%)	**-4.6pp*** 40.9% (42.4%)
MTR Overestimation Share >5pp (>10pp)	9.4pp 17.4% (12.2%)	6.4pp 14.5% (6.8%)	9.4pp 25.8% (15.2%)	11pp 18.2% (10.6%)
MTR Underestimation Share >5pp (>10pp)	-13.8pp 30.7% (23.7%)	-17.2pp 31.6% (27.4%)	-9.9pp 15.2% (10.6%)	-14.6pp 15.2% (31.8%)

Notes: This table shows descriptive evidence of ATR and MTR Misperception. Reported ATR/MTR is the mean value of reported ATRs by legal form. Actual ATRs/MTRs are calculated benchmark ATRs. ATR/MTR Misperception is calculated as Reported ATR/MTR minus Actual ATR/MTR. ***, **, and * denote significance at the 1%, 5%, and 10% levels of a two-sided t-test (ATR/MTR Misperception = 0). ATR/MTR Overestimation measures the average ATR/MTR Misperception in case of positive deviations, and ATR/MTR Underestimation measures the average ATR/MTR Misperception in case of negative deviations. Share >5pp (>10pp) gives the share of all firms that misperceive, overestimate, or underestimate the Actual ATR/MTR by more than ±5pp (±10pp).

TABLE B.18: OLS Regression of ATR and MTR Misperception (Robust)

| | *Dependent variable:* | | | |
| | $\text{ATR}_{\text{retained}}$ | $\text{MTR}_{\text{retained}}$ | $\text{ATR}_{\text{distributed}}$ | $\text{MTR}_{\text{distributed}}$ |
	(1)	(2)	(3)	(4)
Employees	−0.007	0.008**	−0.007	0.008*
	(0.005)	(0.004)	(0.005)	(0.004)
Corporation	−0.069***	0.025	−0.040	0.041
	(0.020)	(0.021)	(0.027)	(0.028)
Employees x Corporation	0.004	−0.018**	0.011	−0.009
	(0.008)	(0.007)	(0.009)	(0.009)
Loss	0.014	0.012	0.007	0.001
	(0.013)	(0.014)	(0.014)	(0.014)
Tax Assistance	−0.002	−0.0003	−0.006	−0.001
	(0.016)	(0.015)	(0.018)	(0.015)
Tax Knowledge Index	−0.011***	−0.027***	−0.016***	−0.031***
	(0.004)	(0.004)	(0.004)	(0.005)
Tax Satisfaction Index	−0.028***	−0.014***	−0.026***	−0.011**
	(0.006)	(0.005)	(0.006)	(0.005)
Female	−0.012	−0.008	−0.002	0.0003
	(0.011)	(0.012)	(0.011)	(0.013)
Manager	0.008	0.015	−0.012	−0.002
	(0.017)	(0.028)	(0.030)	(0.037)
Constant	0.117***	0.061**	0.138***	0.078**
	(0.022)	(0.030)	(0.033)	(0.038)
Observations	478	478	478	478
R^2	0.198	0.116	0.102	0.096
Adjusted R^2	0.183	0.099	0.085	0.079

Notes: This table shows the OLS regression results of ATR and MTR misperception. The dependent variables in columns (1) and (2) represent the case where corporations report their ATR and MTR on retained profits, and the dependent variables in columns (3) and (4) represent the case where corporations report their ATR and MTR on distributed profits. All variables are defined in more detail in the Appendix A2. Robust standard errors are in parentheses. * $p < .1$, ** $p < .05$, *** $p < .01$.

TABLE B.19: OLS Regression of ATR and MTR Over-/Underestimation (Robust)

	Dependent variable:							
	$\text{ATR}_{\text{retained}}$		$\text{MTR}_{\text{retained}}$		$\text{ATR}_{\text{distributed}}$		$\text{MTR}_{\text{distributed}}$	
	Over	Under	Over	Under	Over	Under	Over	Under
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Employees	−0.022***	0.019***	−0.010**	0.013**	−0.022***	0.018**	−0.010**	0.012**
	(0.004)	(0.007)	(0.004)	(0.006)	(0.004)	(0.008)	(0.004)	(0.006)
Corporation	−0.097***	0.043	0.033*	−0.037	−0.092***	0.090***	0.020	0.016
	(0.017)	(0.026)	(0.020)	(0.026)	(0.024)	(0.031)	(0.027)	(0.030)
Employees x Corporation	0.018***	−0.014	−0.003	−0.005	0.021***	−0.008	0.004	0.0003
	(0.006)	(0.009)	(0.006)	(0.008)	(0.007)	(0.010)	(0.007)	(0.009)
Loss	0.028*	−0.010	0.023	−0.016	0.019	−0.026	0.003	−0.026
	(0.015)	(0.015)	(0.015)	(0.022)	(0.017)	(0.016)	(0.016)	(0.020)
Tax Assistance	0.025*	−0.005	0.012	0.016	0.023	−0.014	0.012	0.013
	(0.013)	(0.025)	(0.013)	(0.028)	(0.014)	(0.035)	(0.014)	(0.025)
Tax Knowledge Index	−0.006	−0.008	−0.003	−0.040***	−0.007*	−0.024***	−0.001	−0.052***
	(0.004)	(0.008)	(0.004)	(0.007)	(0.004)	(0.009)	(0.004)	(0.008)
Tax Satisfaction Index	−0.034***	0.014	−0.030***	−0.006	−0.038***	0.019**	−0.030***	−0.005
	(0.007)	(0.011)	(0.006)	(0.007)	(0.007)	(0.010)	(0.006)	(0.006)
Female	−0.014	0.013	−0.016*	−0.001	−0.009	0.018	−0.011	−0.002
	(0.012)	(0.020)	(0.009)	(0.023)	(0.012)	(0.023)	(0.010)	(0.022)
Manager	0.015	−0.024	0.011	−0.046	0.005	−0.173***	−0.004	−0.091**
	(0.014)	(0.025)	(0.015)	(0.040)	(0.019)	(0.030)	(0.028)	(0.045)
Constant	0.106***	0.038	0.040**	0.140***	0.118***	0.192***	0.056*	0.186***
	(0.019)	(0.044)	(0.020)	(0.052)	(0.023)	(0.062)	(0.030)	(0.053)
Observations	414	64	295	183	373	105	261	217
R^2	0.308	0.379	0.193	0.151	0.265	0.386	0.154	0.187
Adjusted R^2	0.293	0.275	0.168	0.107	0.247	0.327	0.123	0.151

Notes: This table shows OLS regression results of ATR and MTR misperception, which is divided into overestimation and underestimation. The dependent variables in columns (1)-(4) represent the case where corporations report their ATR and MTR on retained profits, and the dependent variables in columns (5)-(8) represent the case where corporations report their ATR and MTR on distributed profits. Note, that underestimates like overestimates have a positive sign. All variables are defined in more detail in the Appendix A2. Robust standard errors are in parentheses. * $p < .1$, ** $p < .05$, *** $p < .01$.

B.5.3 Method

To account for close to zero values of overall ATR and MTR misperception, we additionally run Tobit regressions. Regression results can be found in Table B.20.

TABLE B.20: Tobit Regression of ATR and MTR Misperception

	Dependent variable:			
	$ATR_{retained}$	$MTR_{retained}$	$ATR_{distributed}$	$MTR_{distributed}$
	(1)	(2)	(3)	(4)
Employees	−0.006	0.008**	−0.006	0.008*
	(0.005)	(0.004)	(0.005)	(0.004)
Corporation	−0.069***	0.026	−0.039	0.042
	(0.021)	(0.022)	(0.027)	(0.028)
Employees x Corporation	0.003	−0.019**	0.011	−0.009
	(0.008)	(0.007)	(0.009)	(0.009)
Loss	0.014	0.012	0.007	0.001
	(0.013)	(0.014)	(0.014)	(0.014)
Tax Assistance	−0.001	0.001	−0.006	0.00001
	(0.016)	(0.015)	(0.018)	(0.016)
Tax Knowledge Index	−0.011***	−0.028***	−0.016***	−0.032***
	(0.004)	(0.004)	(0.004)	(0.005)
Tax Satisfaction Index	−0.028***	−0.015***	−0.026***	−0.011**
	(0.006)	(0.005)	(0.006)	(0.005)
Female	−0.011	−0.007	−0.001	0.001
	(0.011)	(0.012)	(0.011)	(0.013)
Manager	0.006	0.018	−0.013	0.002
	(0.017)	(0.029)	(0.030)	(0.037)
Constant	0.136***	0.074**	0.157***	0.091**
	(0.022)	(0.031)	(0.033)	(0.039)
Observations	478	478	478	478
Log Likelihood	454.532	417.822	417.867	389.226
Wald Test (df = 9)	108.237***	76.286***	37.950***	62.560***

Notes: This table shows the Tobit regression results of ATR and MTR misperception. The dependent variables in columns (1) and (2) represent the case where corporations report their ATR and MTR on retained profits, and the dependent variables in columns (3) and (4) represent the case where corporations report their ATR and MTR on distributed profits. All variables are defined in more detail in the Appendix A2. Robust standard errors are in parentheses. * $p < .1$, ** $p < .05$, *** $p < .01$.

Alternatively, we perform multinomial logistic regression where the dependent variable is the category of misperception: *Underestimation*, *Accurate Estimation*, and *Overestimation*. *Accurate Estimation* equals one for firms that estimate their tax rates within ±5pp corridor around their *actual tax rates*.

TABLE B.21: Multinomial Regression of ATR and MTR Misperception

	Dependent variable:							
	$\text{ATR}_{\text{retained}}$ Over	$\text{ATR}_{\text{retained}}$ Under	$\text{MTR}_{\text{retained}}$ Over	$\text{MTR}_{\text{retained}}$ Under	$\text{ATR}_{\text{distributed}}$ Over	$\text{ATR}_{\text{distributed}}$ Under	$\text{MTR}_{\text{distributed}}$ Over	$\text{MTR}_{\text{distributed}}$ Under
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Employees	−0.297***	0.595***	−0.350***	0.139	−0.296***	0.604***	−0.348***	0.135
	(0.104)	(0.155)	(0.129)	(0.086)	(0.105)	(0.157)	(0.129)	(0.087)
Corporation	−0.982*	2.528***	0.512	0.116	−2.584***	2.088***	−0.979*	−0.585
	(0.581)	(0.760)	(0.549)	(0.617)	(0.597)	(0.751)	(0.565)	(0.603)
Employees x Corporation	−0.095	−0.747***	0.068	−0.388**	0.301	−0.660***	0.365*	−0.270
	(0.210)	(0.219)	(0.207)	(0.194)	(0.196)	(0.215)	(0.202)	(0.189)
Loss	−0.251	0.514	0.181	0.238	−0.573*	0.450	−0.168	0.073
	(0.296)	(0.441)	(0.315)	(0.304)	(0.305)	(0.438)	(0.328)	(0.302)
Tax Assistance	0.860*	0.436	0.570	−0.259	0.481	0.379	0.277	−0.356
	(0.450)	(0.663)	(0.515)	(0.415)	(0.448)	(0.682)	(0.493)	(0.422)
Tax Knowledge Index	−0.082	−0.577***	−0.115	−0.683***	−0.198*	−0.637***	−0.188	−0.733***
	(0.114)	(0.213)	(0.126)	(0.127)	(0.117)	(0.217)	(0.129)	(0.129)
Tax Satisfaction Index	−0.675***	0.477**	−0.555***	0.026	−0.827***	0.486**	−0.533***	0.060
	(0.131)	(0.231)	(0.133)	(0.128)	(0.140)	(0.236)	(0.133)	(0.129)
Female	−0.161	0.617	−0.073	0.306	0.058	0.780	0.111	0.322
	(0.290)	(0.505)	(0.330)	(0.299)	(0.301)	(0.507)	(0.329)	(0.303)
Manager	−13.306***	−12.077***	0.391	0.985	−14.907***	−13.503***	0.379	0.944
	(0.741)	(0.728)	(0.845)	(0.841)	(0.750)	(0.733)	(0.835)	(0.844)
Constant	13.872***	7.975***	−1.141	−1.406	15.850***	9.367***	−0.832	−1.253
	(0.800)	(0.995)	(0.963)	(0.942)	(0.814)	(1.020)	(0.943)	(0.946)
Akaike Inf. Crit.	714.069	714.069	950.672	950.672	688.809	688.809	931.387	931.387

Notes: This table shows the multinomial logistic regression results of ATR and MTR misperception. The dependent variable in columns (1)-(4) represent the case where corporations report their ATR/MTR on retained profits, and the dependent variables in columns (5)-(8) represent the case where corporations report their ATR/MTR on distributed profits. All variables are defined in more detail in the Appendix A2. Robust standard errors are in parentheses. * p < .1, ** p < .05, *** p < .01.

C (Mathematical) Complexity and Preferences for Taxation

C.1   Full Survey Questionnaire & Variables

The survey structure is displayed in Figure 3.1 in Section 3.3. The survey contains of five parts. Part III is the main part where respondents were randomized in four different groups. Each question is labeled with the corresponding variable name in parentheses. Interested readers can have a look at the German survey themselves at the following link: `https://mpibonn.eu.qualtrics.com/jfe/form/SV_d13rpDRZiIzAhwx`.

Part I: Understanding Taxes

1. What is the income tax payable on an income of € 50.000, an allowance of € 20.000 and a tax rate of 10%? [Control Taxes 1]
2. What is the income tax payable on an income of € 10.000, an allowance of € 20.000 and a tax rate of 10%? [Control Taxes 2]

Part II: Understanding Growth

3. What is the wealth of a person if they initially own € 100 and then save another 5%, i.e. the wealth increases by 5%? [Control Growth]

Part III: Main Part

4. In your opinion, how much wealth should be exempt from the (yearly/one-time) wealth tax? [Tax Allowance]
5. At what tax rate should the wealth above the chosen allowance be taxed (yearly/once)? [Tax Rate Person 1]
6. At what tax rate should the wealth above the chosen allowance be taxed (yearly/once)? [Tax Rate Person 2]
7. At what tax rate should the wealth above the chosen allowance be taxed (yearly/once)? [Tax Rate Person 3]

Part IV: Choice & Reasoning

8. What type of wealth taxation would you prefer for this person? The burden of the tax is identical in both cases. [Choice]
9. Please explain why you have chosen this type of wealth tax. [Reasoning]

Part V: Personal Background

10. To what extent do you think it is the government's job to redistribute wealth? Think on a scale from 1 to 7. 1 means that it should not be the government's job to redistribute wealth; 7 means it should definitely be the government's job. [Redistribute]
11. To what extent do you agree with the following statement? "Wealth inequality is a serious problem." [Inequality]
12. There are different opinions about the reasons for wealth and economic success. Some see luck and the support of others as the decisive factors, while others see personal commitment and hard work as the main factors. In your opinion, which prerequisite generally plays a greater role? [Luck Effort]
13. What do you suppose is the share of the population that is affected by the current inheritance tax? [Inheritance Tax]
14. Do you expect to be affected by inheritance tax yourself in the future (as bequeather or heir)? [Future Tax]
15. Please indicate your sex assigned at birth. [Female]
16. Please indicate your age. [Age]
17. Have you ever had to pay inheritance tax yourself? [Past Tax]
18. Do you or your close family own a business? [Entrepreneur]
19. How many children do you have? [Children]
20. What is your nationality? [Nationality]
21. What is your marital status? [Married]
22. What is your highest educational qualification? [University]
23. What is your current employment status? [Employed]
24. What is your current net monthly income (i.e. after taxes and duties)? [High Income]
25. How would you most likely classify your political orientation? [Political Orientation]
26. Which party would you most closely align yourself with? [Left Parties]

C.2 Additional Tables

TABLE C.1: Variable Definitions.

Variable	Definition
Effective Tax Rate	Calculation described in Section 3.2.1
Age	entered age in years
Female	1 if gender is female, otherwise 0
Married	1 if marital status is, otherwise 0
Inheritance Tax	estimated share of population that is affected by inheritance tax (0,1)
Past Tax	1 if already paid inheritance tax, otherwise 0
Future Tax	1 if expect to be affected by inheritance tax, otherwise 0
Left Parties	1 if Party is "SPD", "Die Linke" or "Bündnis 90/ Die Grünen", otherwise 0
Redistribute	7 point likert scale: government should redistribute wealth
Inequality	7 point likert scale: inequality is a serious problem
Children	1 if one or more children, otherwise 0
University	1 if Bachelor, Master or PhD, otherwise 0
High Income	1 if personal monthly net income € 3,000 or more, otherwise 0
Employed	1 if full-time, part-time or self employed, otherwise 0
Control	arithmetic mean of Control Tax 1, Control Tax 2 and Control Growth (0,1)

Note: This table shows definitions of our mainly used survey-based variables.

TABLE C.2: Summary Statistics.

Statistic	N	Mean	SD	Min	.25	.75	Max
Effective Tax Rate	3,747	0.311	0.271	0.000	0.094	0.477	0.980
Age	1,249	51.864	13.915	18	41	63	83
Female	1,249	0.384	0.486	0.000	0.000	1.000	1.000
Inheritance Tax	1,248	0.292	0.207	0.010	0.138	0.400	1.000
Future Tax	1,249	0.264	0.441	0.000	0.000	1.000	1.000
Past Tax	1,247	0.059	0.235	0.000	0.000	0.000	1.000
Left Parties	1,244	0.461	0.499	0.000	0.000	1.000	1.000
Redistribute	1,249	4.259	1.788	1.000	3.000	5.000	7.000
Inequality	1,249	5.254	1.670	1.000	4.000	7.000	7.000
Children	1,243	0.615	0.487	0.000	0.000	1.000	1.000
University	1,248	0.376	0.485	0.000	0.000	1.000	1.000
High Income	1,247	0.272	0.445	0.000	0.000	1.000	1.000
Employed	1,248	0.616	0.487	0.000	0.000	1.000	1.000
Control	1,249	0.943	0.155	0.000	1.000	1.000	1.000

Note: This table presents summary statistics of all variables used in our regression analysis.

TABLE C.3: Randomization Check.

	Yearly Wealth Tax		One-Time Wealth Tax	
	Control	Treatment	Control	Treatment
Age	0.0003	−0.0006	0.0001	0.0002
	(0.0009)	(0.0009)	(0.0009)	(0.0009)
Female	−0.0418*	0.0405	0.0040	-0.0026
	(0.0250)	(0.0249)	(0.0249)	(0.0259)
Married	0.0134	−0.0281	−0.0089	0.0236
	(0.0244)	(0.0242)	(0.0243)	(0.0252)
Income				
€0-€999	−0.0328	−0.0344	0.0267	0.0404
	(0.0362)	(0.0360)	(0.0361)	(0.0376)
€1.000-€1.999	−0.0244	−0.0203	0.0210	0.0237
	(0.0253)	(0.0251)	(0.0252)	(0.0263)
€2.000-€2.999	0.0205	−0.0045	0.0236	−0.0396
	(0.0288)	(0.0286)	(0.0287)	(0.0298)
€3.000-€3.999	−0.0097	0.0179	−0.0503	0.0422
	(0.0317)	(0.0315)	(0.0316)	(0.0329)
€4.000-€4.999	0.0859*	0.0644	−0.0584	−0.0919*
	(0.0497)	(0.0494)	(0.0495)	(0.0515)
€5.000 and more	0.0717	0.1061	−0.0434	0.1344*
	(0.0737)	(0.0732)	(0.0735)	(0.0764)
Children	0.0324	−0.0387	−0.0128	0.0191
	(0.0251)	(0.0249)	(0.0249)	(0.0260)
University	0.0137	−0.0012	0.0017	−0.0142
	(0.0252)	(0.0250)	(0.0251)	(0.0261)
Employed	−0.0324	0.0547**	−0.0185	−0.0038
	(0.0250)	(0.0248)	(0.0249)	(0.0260)
p-value	0.3048	0.1169	0.8928	0.2925

Note: This table shows coefficients of a series of OLS regressions in the form of $Group_i = \alpha + \beta \cdot Covariate_i + \epsilon_i$, where $Group_i$ is a dummy indicating the group status and $Covariate_i$ is any of the listed variables. The p-value of F-statistic for joint significance of all listed $Covariates$ explaining the group status is added at the bottom of the table. Standard errors in parentheses: $^*p < 0.1$, $^{**}p < 0.05$ and $^{***}p < 0.01$.

TABLE C.4: Full Baseline Regression Results.

| | **Effective Tax Rate** | | | |
| | *Random Effects Model* | | *Tobit Model* | |
	(1)	(2)	(3)	(4)
Constant	0.023*** (0.008)	−0.161*** (0.053)	−0.027 (0.021)	−0.233*** (0.069)
Info Treatment	−0.010 (0.011)	−0.001 (0.010)	−0.011 (0.028)	−0.002 (0.027)
Yearly Wealth Tax	0.384*** (0.018)	0.393*** (0.017)	0.391*** (0.024)	0.400*** (0.024)
Info Treatment x Yearly Wealth Tax	−0.137*** (0.025)	−0.145*** (0.024)	−0.135*** (0.032)	−0.145*** (0.032)
Age		0.0004 (0.001)		0.0004 (0.001)
Female		0.012 (0.012)		0.019 (0.015)
Inheritance Tax		0.124*** (0.030)		0.140*** (0.037)
Future Tax		−0.017 (0.014)		−0.024 (0.017)
Past Tax		−0.017 (0.029)		−0.023 (0.025)
Left Parties		0.015 (0.013)		0.020 (0.014)
Redistribute		0.029*** (0.004)		0.034*** (0.005)
Inequality		0.005 (0.005)		0.007 (0.005)
Children		0.0001 (0.014)		−0.002 (0.015)
University		−0.003 (0.013)		−0.009 (0.014)
High Income		−0.010 (0.014)		−0.008 (0.015)
Employed		−0.005 (0.014)		−0.006 (0.015)
Control		−0.030 (0.036)		−0.047 (0.047)
€ 3,000,000	0.171*** (0.005)	0.172*** (0.005)	0.211*** (0.009)	0.213*** (0.009)
€ 10,800,000	0.245*** (0.006)	0.246*** (0.007)	0.289*** (0.006)	0.290*** (0.006)
Observations	3,747	3,696	3,747	3,696
Adjusted R^2	0.466	0.480		
Log Likelihood			369.622	431.860

Note: This table presents the regression results from random effects estimations (columns (1) and (2)) and Tobit estimations (columns (3) and (4)) using the dependent variable effective tax rate. The wealth level effects are relative to the € 350,000 level. Robust standard errors clustered at the respondent level. Standard errors in parentheses: $^*p < 0.1$, $^{**}p < 0.05$ and $^{***}p < 0.01$.

TABLE C.5: Heterogeneous Treatment Effects in the Yearly Wealth Tax Group.

	Effective Tax Rate	
	Random Effects Model	*Tobit Model*
	(1)	(2)
Constant	0.029 (0.146)	−0.115 (0.164)
Info Treatment	0.150 (0.206)	0.250 (0.241)
Age	0.001 (0.001)	0.001 (0.002)
Female	0.068** (0.032)	0.085** (0.041)
Inheritance Tax	0.326*** (0.078)	0.395*** (0.102)
Future Tax	0.008 (0.038)	−0.007 (0.042)
Past Tax	−0.171** (0.074)	−0.205*** (0.060)
Left Parties	0.036 (0.033)	0.045 (0.035)
Redistribute	0.041*** (0.011)	0.051*** (0.012)
Inequality	0.006 (0.013)	0.007 (0.012)
Children	−0.025 (0.037)	−0.022 (0.037)
University	−0.031 (0.033)	−0.028 (0.035)
High Income	−0.018 (0.037)	−0.017 (0.040)
Employed	−0.020 (0.036)	−0.016 (0.038)
Control	−0.043 (0.090)	−0.031 (0.130)
€ 3,000,000	0.270*** (0.013)	0.312*** (0.023)
€ 10,800,000	0.352*** (0.015)	0.400*** (0.016)
Info Treatment x Age	−0.001 (0.002)	−0.001 (0.002)
Info Treatment x Female	−0.028 (0.044)	−0.042 (0.056)
Info Treatment x Inheritance Tax	−0.232** (0.108)	−0.285** (0.142)
Info Treatment x Future Tax	−0.044 (0.053)	−0.033 (0.065)
Info Treatment x Past Tax	0.262*** (0.092)	0.308*** (0.097)
Info Treatment x Left Parties	−0.012 (0.046)	−0.019 (0.053)
Info Treatment x Redistribute	−0.018 (0.016)	−0.025 (0.018)
Info Treatment x Inequality	−0.005 (0.018)	−0.005 (0.020)
Info Treatment x Children	0.055 (0.051)	0.053 (0.058)
Info Treatment x University	0.022 (0.047)	0.012 (0.053)
Info Treatment x High Income	0.016 (0.051)	0.014 (0.058)
Info Treatment x Employed	0.033 (0.050)	0.025 (0.058)
Info Treatment x Control	−0.116 (0.135)	−0.145 (0.173)
Info Treatment x € 3,000,000	−0.063*** (0.017)	−0.061** (0.030)
Info Treatment x € 10,800,000	−0.071*** (0.021)	−0.070*** (0.020)
Observations	1,794	1,794
Adjusted R^2	0.491	
Log Likelihood		−106.087

Note: This table presents the regression results from random effects estimations (column (1)) and Tobit estimations (column (2)) using the dependent variable effective tax rate. The wealth level effects are relative to the € 350,000 level. Robust standard errors clustered at the respondent level. Standard errors in parentheses: $^*p < 0.1$, $^{**}p < 0.05$ and $^{***}p < 0.01$.

TABLE C.6: Full Logistic Regression Results.

	Choice: Yearly Wealth Tax			
	(1)	(2)	(3)	(4)
Constant	0.023*	−0.146**	−0.027	−0.211***
	(0.013)	(0.065)	(0.021)	(0.079)
Info Treatment	−0.079	−0.026	−0.062	−0.035
	(0.188)	(0.196)	(0.190)	(0.196)
Yearly Wealth Tax	0.767***	0.863***	0.158	0.407
	(0.222)	(0.230)	(0.255)	(0.272)
Info Treatment x Yearly Wealth Tax	−0.252	−0.382	0.0004	−0.182
	(0.302)	(0.314)	(0.309)	(0.322)
Effective Tax Burden			0.136***	0.097***
			(0.030)	(0.032)
Age		0.011		0.010
		(0.007)		(0.007)
Female		−0.050		−0.048
		(0.163)		(0.164)
Inheritance Tax		0.086		−0.046
		(0.413)		(0.417)
Future Tax		−0.108		−0.099
		(0.189)		(0.190)
Past Tax		−0.233		−0.244
		(0.324)		(0.325)
Left Parties		0.179		0.176
		(0.166)		(0.166)
Redistribute		0.146***		0.105*
		(0.056)		(0.058)
Inequality		0.098*		0.092
		(0.059)		(0.059)
Children		−0.247		−0.240
		(0.185)		(0.185)
University		−0.227		−0.236
		(0.164)		(0.164)
High Income		0.248		0.273
		(0.188)		(0.189)
Employed		0.575***		0.574***
		(0.178)		(0.179)
Control		0.485		0.448
		(0.482)		(0.486)
Observations	1,097	1,082	1,097	1,082
Log Likelihood	−569.689	−537.574	−558.853	−532.945

Note: This table presents the regression results from logistic estimations using the dependent variable choice (yearly wealth tax = 1, one-time wealth tax = 0). Standard errors in parentheses: $^*p < 0.1$, $^{**}p < 0.05$ and $^{***}p < 0.01$.

C.3   Further Aspects

C.3.1   Share affected by Inheritance Taxation in Germany

This paper focuses on misperceived tax burden consequences in the context of the highly complex yearly wealth tax, but knowledge about inheritance taxation in Germany could also play a role. We asked our participants for their best guess on what share of the German population is affected by the existing inheritance tax. We argue that respondents giving percentages closer to the actual share of the German population are generally better informed about wealth distribution and wealth taxation in Germany.

However, it is not straightforward to calculate the precise share of those affected by the inheritance tax, even based on official data. The German official data on inheritance and gift taxation ("Erbschaft- und Schenkungsteuerstatistik") contains the number of taxable inheritances for each year. Also the number of deaths per year is known. But, in contrast to the estate tax, the inheritance tax is not levied at the level of the deceased person, but at the heir level. Hence, in case of 100 deaths and 100 taxable inheritances the share of affected can be between 100% (for a decedent-heir ratio of 1, i.e. every decedent passes his assets to only one heir) and 1% (for a decedent-ratio of 100; i.e. only one decedent passes his assets to 100 heirs). Furthermore, a tax on an inheritance is usually not determined in the same year of the decedents' death. This makes a direct assignment even more difficult. According to the "Statistisches Bundesamt" the number of deaths in Germany accounted for 985,572 in 2020.[1] At the same time, the number of taxable inheritances accounted for 133,326 in 2020.[2] Hence, even in the unrealistic case of only one heir per decedent, the share of those affected by the inheritance would be about 10% - 15%. Assuming three heirs per decedent already decreases this number to less than 5%.

Another way to estimate who is affected by the inheritance tax is to compare the basic tax allowances and the wealth distribution in Germany. While the minimum tax allowance only accounts for €20,000, each parent can transfer assets worth €400,000 to each child without being taxed. Hence, inter-generational transfers of parents with 2 children are tax-free up to €1.6 Mio.. Furthermore, additional tax exemptions apply if businesses or family homes

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[1]   https://de.statista.com/statistik/daten/studie/156902/umfrage/sterbefaelle-in-deutschland/ (07.06.2022).

[2]   https://www.destatis.de/DE/Themen/Staat/Steuern/Weitere-Steuern/Tabellen/ erbschaftsteuer-erbschaft-schenkungstatistik.html (07.06.2022).

are transferred. According to a recent study of the Bundesbank, only 10% of German house-holds own assets worth more than €555,400. Even the top 5% own only about €850,000.[3] Therefore, we considered reported shares below 10% to be right.

C.3.2 Round Number Bias

Since all other common taxes (e.g., income tax or sales tax) use double-digit tax rates, people might be anchored at these salient round tax rates. For example, to obtain similar effective tax burden in both wealth tax instruments, respondents need to use an uncommon tax rate range from 0.5% to 2% in the *yearly* wealth tax group, while respondents can use common tax rate ranges from 15% to 45% in the *one-time* wealth tax group.[4] The limited tax rate margin for a yearly wealth tax implies that people should also use decimals although probably having a round number bias.

In Figure C.1, we illustrate the potential *round number bias* for the *yearly* wealth tax across our three hypothetical persons.

FIGURE C.1: Round Number Bias.
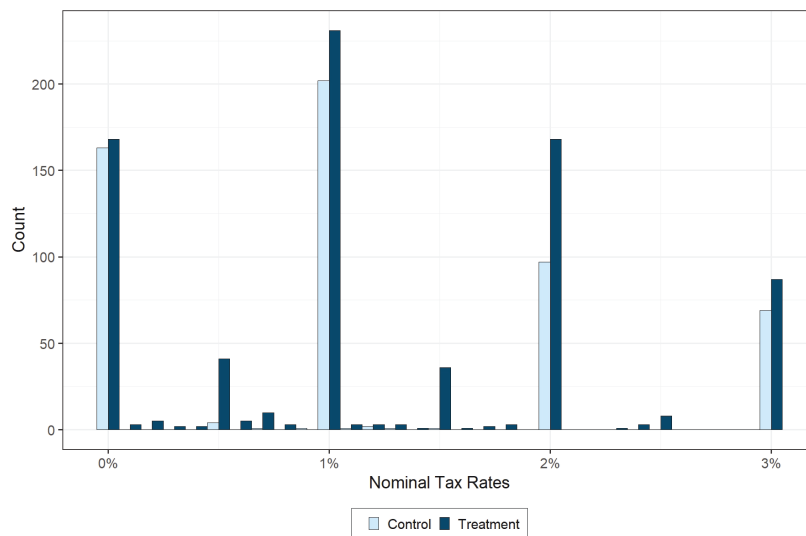
Note: Absolute frequency of inserted nominal tax rates within the range of 0% to 3% in the *yearly* wealth tax group.

This figure nicely shows that the information treatment also causes a move away from rounded figures. While the control group almost exclusively used the round number 0%, 1%, 2% and 3%, the treatment group also used very specific decimals. Regarding the total

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[3] https://www.bundesbank.de/resource/blob/794130/d523cb34074622e1b4cfa729f12a1276/mL/2019-04-vermoegensbefragung-data.pdf (07.06.2022).

[4] This applies if we disregard the tax allowance and assume the *savings plan* of our study.

tax rate distribution, 22% of the treated *yearly* wealth tax group used at least one tax rate with decimals, while this is only the case in 3.3% of the control group.

Since, on the one hand, the information treatment increases the probability of using decimal places and, on the other hand, the *round number bias* does not necessarily go in only one direction, we can argue that the *round number bias* has only little influence on our results.

C.3.3 Progressivity

In our survey design, we can also measure the treatment effect for different wealth levels. The treatment effect exists in the yearly wealth tax setting throughout all presented accumulated wealth levels (€ 350,000; € 3,000,000; € 10,800,000). In contrast, there is no statistically significant treatment effect for each of the accumulated wealth levels in the *one-time* wealth tax group. The smaller effect of the treatment for the lowest wealth level can be partly attributed to a higher proportion of rejection of a wealth tax for an individual with a net wealth of € 350,000, because a rejection in the form of an exceeding tax allowance or a yearly tax rate of 0% is not affected by the treatment.[5]

FIGURE C.2: Preferences for Progressive Wealth Taxation.
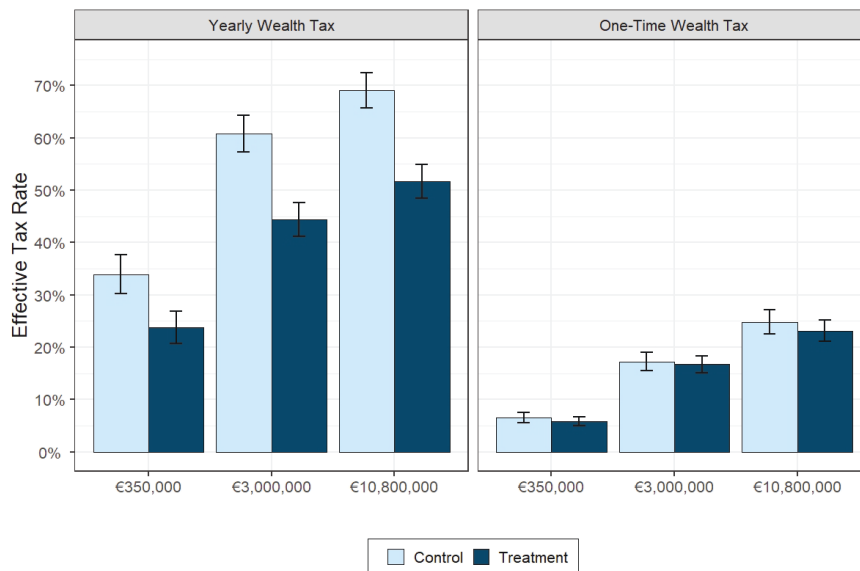
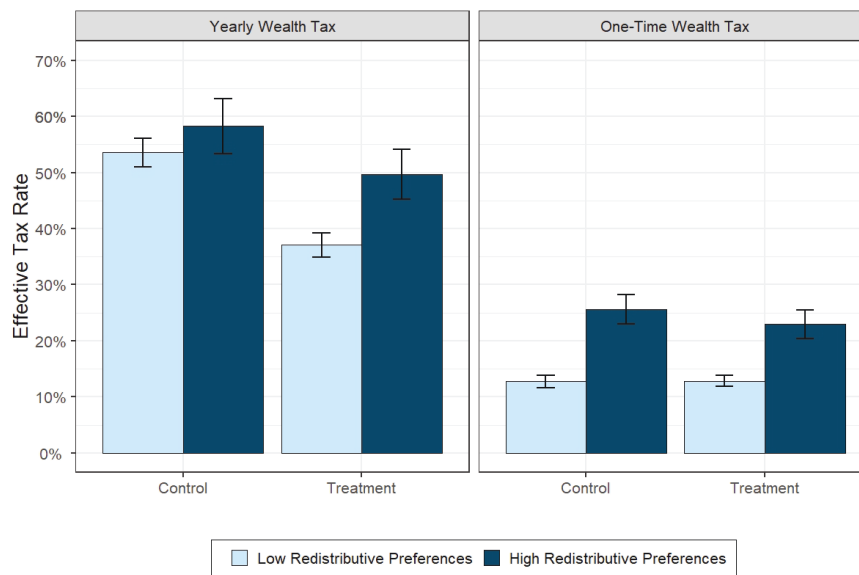Note: Effective tax rates by wealth levels and experimental groups with 95% confidence bars.

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[5] Rejection shares for an accumulated wealth stock of € 350,000 are about 30% in all four groups.

We find people having preferences for a progressive wealth tax. In both groups, effective tax rates clearly increase with wealth levels.[6] For example, respondents, on average, state 20.7 (10.9) percentage points higher effective tax rates for a hypothetical person with accumulated wealth of €3,000,000 compared to €350,000 in case of a yearly (one-time) wealth tax. The higher progressivity, however, is relativized if one takes into account the significantly lower level of taxation at an accumulated wealth of €350,000 in case of a one-time wealth tax.

C.3.4   Redistributive Preferences

Effective tax burdens depend on one's own redistributive preferences. This effect is similar in both wealth tax groups (see Table C.4). Redistribution preferences are thus very clearly reflected in the effective tax burdens. To further emphasize the importance of information we can see how people might not be able to express their preferences in a yearly wealth tax system. Figure C.3 illustrates the effective tax rates by redistributive preferences and wealth tax instrument.

FIGURE C.3: Redistributive Preferences.

Note: Effective tax rates by redistributive preference (median split) and experimental groups with 95% confidence bars.

While redistributive preferences are clearly reflected both in the control and treatment group of the one-time wealth tax, the redistributive preferences in case of a yearly wealth tax are

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6   It should be noted that progressivity in terms of effective tax rates can also result from a constant tax rate for each wealth bracket. Thus, while we find strict progressivity in effective tax rates in more than 90% of cases, only about half of them are accompanied by strictly increasing tax rates.

less distinctive in the control group than in the treatment group.[7] This highlights how tax misperceptions might shape the actual political outcome.

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[7] Respondents with low redistributive preferences in the control group even indicate higher effective tax rates than respondents with high redistributive preferences in the treatment group.

D Steuerbelastung deutscher Kapitalgesellschaften

TABELLE D.1: Deskriptive Statistik des Finalen Samples

Variable	N	Mittelwert	Median	SD	Min.	Max.
ETR	10.279	0,298	0,301	0,102	0,000	1,000
CETR	10.279	0,297	0,300	0,110	-0,357	2,479
BE	10.279	0,036	0,000	0,133	-0,388	2,878
BS	10.279	9,375	9,340	1,270	0,470	15,172
MNE	10.279	0,775	1,000	0,418	0,000	1,000
VERB	10.246	0,409	0,391	0,238	0,001	1,317
ROA	10.279	0,120	0,092	0,112	0,000	2,812
RS	10.251	0,123	0,088	0,118	0,000	0,971
IMVG	9.240	0,014	0,003	0,042	0,000	0,930
SAV	10.245	0,207	0,145	0,184	0,000	1,750
NDIFF	10.279	0,000	0,000	0,020	-0,070	0,053
VERLUST	10.279	0,114	0,000	0,318	0,000	1,000

Deskriptive Statistik der Größen der Regressionsgleichung für das Finale Sample

TABELLE D.2: Ergebnis der Cross-Sectional OLS Regression

Variable	ETR			ETR		
	Koeffizienten	t-Statistik		Koeffizienten	t-Statistik	
Konstante	0,294683	22,921	***	0,314791	23,814	***
BE	-0,196697	-25,303	***			
BS	-0,000728	-0,593		-0,004584	-3,647	***
MNE	-0,001548	-0,719		0,003483	1,564	
VERB	0,029906	6,245	***	0,035200	7,119	***
ROA	-0,044654	-4,250	***	-0,038556	-3,577	***
RS	0,109445	7,765	***	0,118904	8,281	***
IMVG	0,066447	1,437		0,065808	1,429	
SAV	-0,036385	-5,859	***	-0,024983	-3,958	***
NDIFF	0,764734	16,315	***	0,733389	15,076	***
VERLUST	0,006625	1,328		0,003187	0,630	**
Adj. R^2	11,98 %			6,14 %		
F-Statistik	109,90			49,35		
p-Wert	0,00			0,00		

Ergebnis der Cross-Sectional OLS Regression der durchschnittlichen ETR (bezogen auf das *unbereinigte* Jahresergebnis auf unterschiedliche Einflussfaktoren (definiert in Gleichung 4.6) unter Berückscihtigung robuster Standardfehler. Signifikanzniveaus: * $p < 0.1$; ** $p < 0.05$ und *** $p < 0.01$.

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