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Mental accounting of income tax and value added tax among self-employed business owners

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ABSTRACT

Mental accounting describes a series of cognitive operations that help organize financial activities and facilitate money management. Self-employed taxpayers who make use of a separate mental account for future income tax payments or collected value added tax (VAT) might find it easier to declare their taxes correctly than taxpayers who do not. This study used a questionnaire to investigate whether self-employed taxpayers ($N = 350$) use mental accounting to manage their income tax and VAT obligations, whether mental accounting relates to tax knowledge, business and personality characteristics, and to what extent mental accounting is related to intended tax behavior. Our results reveal that some taxpayers mentally segregate taxes from turnover (segregators) while others do not (integrators). We found small differences in mental accounting between income taxes and VAT. Moreover, confirmatory factor analyses suggested that tax knowledge and mental accounting are distinct constructs. Segregation of taxes was related to lower impulsivity and more positive attitudes toward taxation. Individuals who stated they segregate taxes due from turnover more often claimed to run financially prosperous businesses. Mental accounting was not related to intentions of evading taxes, but individuals with higher mental accounting scores reported more pronounced levels of tax planning. While our research design does not allow drawing causal inferences, these findings could suggest that increasing self-employed taxpayers' ability to organize their financial activities might be a promising strategy to strengthen the competitiveness of their businesses.

1. Introduction

Self-employed taxpayers are of particular interest from both a policy and a research perspective. They are typically considered as less compliant than wage-earners, because they have more opportunities to evade (Kirchler, 2007; Kleven, Knudsen, Kreiner, Pedersen, & Saez, 2011; Slemrod, 2007), and a higher propensity to take the financial risk inherent to tax evasion (Cramer, Hartog, Jonker, & Van Praag, 2002). But small business owners differ from wage-earners on other dimensions as well. First, they are usually subject to multiple taxes and also have to collect indirect taxes such as value added tax (VAT). Second, they are obliged to administer their business' financial activities themselves. They have to organize their earnings and expenses, issue and keep track of invoices, and prepare their tax returns with or without the help of a tax professional to meet their obligations towards the tax agency. Such self-

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administration requires skills in book-keeping, knowledge about tax law, and some degree of self-control.

Mental accounting theory – an approach from behavioral finance and the judgment and decision making literature – describes cognitive processes individuals apply to keep track of their earnings and expenses, mainly by categorizing their financial activities and assigning them to specific budgets (Thaler, 1999). A substantial body of literature explores effects of mental accounting, especially on consumer choice (e.g., Heath & Soll, 1996; Krishnamurthy & Prokopec, 2010; Prelec & Loewenstein, 1998; Ranyard, Hinkley, Williamson, & McHugh, 2006; Thaler, 1985, 1999; for an overview see Antonides & Ranyard, 2018). More recently, mental accounting theory has also been used to understand taxpayers' compliance decisions. There is initial indication that self-employed taxpayers differ in their use of mental accounting (Adams & Webley, 2001; Muehlbacher & Kirchler, 2013) and that mental accounting relates to income tax compliance (Muehlbacher, Hartl, & Kirchler, 2017). In essence, findings suggest that non-compliance is not necessarily the result of low tax morale, but may sometimes originate from a lack of ability to handle one's tax obligations.

However, the literature does not yet quantify the prevalence of mental accounting among self-employed taxpayers nor does it explore potential origins of interindividual differences in the mental segregation of taxes, such as personality (e.g., knowledge, conscientiousness, impulsivity) or business characteristics (e.g., turnover, years of self-employment, financial scarcity). Furthermore, prior work on mental accounting of taxes has not compared income taxes and VAT, but only considered either one or the other. Since the mechanisms underlying these taxes differ substantially, so might the use of mental accounting. Finally, only little is known about how mental accounting relates to tax evasion and tax planning. In this article we address these gaps in the literature.

Analyzing survey responses of self-employed taxpayers from Germany and Austria, this paper investigates the prevalence of mental accounting of income taxes and VAT. First, we explore whether there are interindividual differences in mental accounting. Second, we test whether self-employed taxpayers differ in their mental segregation of income taxes and VAT. Third, we investigate whether the use of mental accounting is mainly a consequence of profound tax knowledge. Fourth, we analyze the relationship of personality and business characteristics with mental accounting. Finally, we investigate how mental accounting and several business characteristics relate to intended tax behavior (tax planning and tax evasion). In line with open science recommendations for increasing transparency in research, our research questions have been preregistered on the Open Science Framework (osf) using the as-predicted template (<https://osf.io/sj9yk/>). Materials and data have been made available (<https://osf.io/fq8ne/>).

2. Related literature

2.1. Mental accounting

Early work on judgment and decision making defined mental accounting as a set of cognitive operations to keep track of one's financial activities and as a strategy to overcome self-control problems in spending and consumption (Kahneman & Tversky, 1984; Shefrin & Thaler, 1988; Thaler, 1985). The most prominent notion of this theory is the assumption that transactions are categorized and organized in mental accounts with specific budgets. These accounts are dedicated to a distinct spending category such as leisure, rent, or food. However, mental accounting also describes basic cognitive decision processes in the editing and elaboration of a given decision. For instance, when facing multiple potential outcomes, individuals may either value these jointly, i.e., they integrate different decision outcomes, or evaluate them separately, i.e., they segregate the different outcomes (cf. hedonic editing; Thaler, 1999). Depending on how sources of income and spending opportunities are perceived, categorized, and labeled, individuals' decisions to spend, and the willingness to take risks, may vary substantially (Thaler, 1999).

Mental accounting theory has been used to explain irrational behavior in a wide array of settings, such as price perceptions and consumer behavior (Heath, Chatterjee, & France, 1995; Moon, Keasey, & Duxbury, 1999), the use of different payment methods (Helion & Gilovich, 2014;), lottery choices (Langer & Weber, 2001), stock market investments (Barberis & Huang, 2001; Lim, 2006), real estate investments (Seiler, Seiler, & Lane, 2012), and credit application (Ranyard et al., 2006). However, keeping mental accounts often serves to facilitate money management. Accordingly, a survey study from the Netherlands found that mental accounting relates positively to education, financial knowledge, and money management at the household level (Antonides, de Groot, & van Raaij, 2011). While money management might also be relevant for tax compliance, research on the role of mental accounting in taxpayer behavior is relatively scarce. The next section summarizes the existing literature.

2.2. Mental accounting and taxes

Prior work explored different aspects of the relationship between mental accounting and taxpayer behavior. For instance, an experimental study showed that individuals consume more and save less when they receive small monthly tax refunds compared to a larger lump-sum refund. The authors argue that a bigger amount refunded by the tax office at the end of a year is more likely to be transferred to a savings account than smaller refunds received monthly, which are more easily spent for everyday consumption (Chambers & Spencer, 2008). Accordingly, another study found that shifting income from large lump-sum refunds into a consumption-related mental account of monthly payments increases consumption and decreases saving (Feldman, 2010). It was also shown that the money from tax refunds is more likely to be used for "serious" expenses such as paying outstanding invoices (O'Curry, 1999).

Little is known, however, on the role of mental accounting in tax compliance behavior. Bhattacharjee, Moreno, and Salvador (2015) draw on the hedonic editing hypothesis from mental accounting theory (see Thaler, 1999) to explain why having to file multiple tax returns, e.g., for income taxes at the state and federal level, can affect compliance. Prior work on the effects of keeping an extra mental account for taxes due is of greater importance for this study. Interviews with self-employed taxpayers provide first

evidence for the relevance of mental accounting (Adams & Webley, 2001). The study initially had a different scope, but some of the entrepreneurs' statements let the authors conclude that differences in the application of mental accounting could explain taxpayers' attitudes towards VAT and their compliance behavior. Probably the most clear-cut statement reported from these interviews is the following: "[VAT] is not a cost to the business, we are just looking after the money for the government. There is no point worrying about paying. It is their money" (pp. 208–209). While some interviewees seemed to mentally segregate collected tax from their revenues, others did not. In other words, some taxpayers seem to keep a separate mental account for future tax payments (mental segregation), while others organize all their business transactions in one single mental account (mental integration). In the statement quoted above, the respective person also expresses a positive attitude towards VAT and willingness to comply.

Similar statements were found in another study conducted in Austria, where self-employed taxpayers were interviewed about money management and their handling of taxes. Survey-items were developed on basis of the interview protocols that assessed the individual tendency towards mental segregation and integration. The resulting survey was distributed among self-employed taxpayers to explore correlates of mental accounting of taxes. Mental segregation – the more favorable mental accounting practice – was positively related to respondents' age, positive attitudes towards taxation, and (self-reported) tax compliance (Muehlbacher & Kirchler, 2013). While the Austrian survey did not differentiate explicitly between different types of taxes, a survey conducted in the UK asked specifically about VAT compliance (Webley, Adams, & Elffers, 2006). In general, similar results were observed and mental accounting was related to self-reported compliance. However, a more objective compliance indicator – British Customs and Excise officials classified survey respondents as compliers or non-compliers – was not related to mental accounting (at the same time self-reported compliance did not differ between compliers and non-compliers). Additionally, the authors report a non-significant relationship between mental accounting and compliance intentions in a pilot study where mental accounting was measured only by a single item.

In a recent experimental study on the impact of mental accounting on tax compliance behavior (Muehlbacher et al., 2017) participants were either informed about their gross income or their net income with taxes due displayed separately. Individuals' tendency to use mental integration or segregation was measured by a short Likert-type scale. Results showed an interaction effect of the experimental treatment and individuals' mental accounting practices: income tax compliance was higher when tax due and net income were displayed separately, especially among participants who tended to mentally segregate tax due from gross income.

In another experiment, participants were allowed to choose whether they would like to pay the income tax monthly or quarterly (Chambers & Curatola, 2012). Those opting for the monthly pay plan were more compliant. The authors argue that more frequent payments facilitate mental accounting by associating the tax more closely to the time the income is earned, which in turn results in higher compliance.

An experiment on VAT compliance tried to manipulate participants' use of mental accounting by stating that VAT had to be collected from customers and forwarded to the authorities (segregation), or that VAT had to be paid from the profits made in the experiment (integration) (Webley et al., 2006). While the experimental manipulation had no effect on participants' compliance, a Likert-type measure of individuals' mental accounting was related to VAT compliance. These findings are in line with our own experimental research (Olsen, Kogler, Muehlbacher, & Kirchler, in preparation).

In sum, prior research on mental accounting and tax compliance suggests that self-employed taxpayers differ in their perception and categorization of taxes due. But findings on the effects of experimentally framing taxes as segregated versus integrated on tax compliance are ambiguous. One possible explanation for these inconsistent findings is that mental accounting might be better described as a trait rather than a situational state which depends on information presentation.

2.3. Income tax and VAT

Behavioral tax research focuses mostly on direct taxes, particularly income tax. It is a *direct* tax as taxpayers pay a proportion of their income directly to the tax office. VAT, on the other hand, is an *indirect* tax, which the taxpayer (customer) pays to an intermediary (supplier), who then transfers it to the tax agency. Together, these two taxes constitute the major sources of tax revenue in OECD countries (OECD, 2014). While determining the correct amount of income tax due is often complex, identifying the amount of VAT due for payment is relatively easy: suppliers pay a net amount of VAT corresponding to the difference of VAT paid on intermediate inputs (input taxes) and taxes levied during sale (output taxes). Consequently, VAT is an administrative rather than a financial burden on self-employed taxpayers (Olsen, Kogler, Stark, & Kirchler, 2017). But while exploratory research provides first indication of interindividual differences in mental accounting of VAT (Adams & Webley, 2001), prior studies have not explored how the different mechanisms underlying direct and indirect taxes relate to mental accounting. The fact that income tax is actually paid by the business owner, whereas VAT is ultimately paid by the customer might influence the mental segregation of taxes due.

2.4. Tax planning and tax evasion

Two concepts shape the debate on the reductions of tax burden fundamentally: tax planning and tax evasion.¹ Tax planning is defined as the legal minimization of tax liability, whereas tax evasion refers to illegal behaviors such as hiding or ignoring tax liability

¹ This paper does not discuss tax avoidance, "a term that is difficult to define but which is generally used to describe the arrangement of a taxpayer's affairs that is intended to reduce his tax liability and that although the arrangement could be strictly legal it is usually in contradiction with the intent of the law it purports to follow." (OECD, 2017).

(OECD, 2017).

Tax planning is an essential aspect of self-employed taxpayers' business activity, since it affects competitiveness, investment, and growth (Donohoe, Lisowsky, & Mayberry, 2015). It is thus crucial that self-employed taxpayers structure their tax payments efficiently and avoid paying more taxes than legally required. For instance, many self-employed taxpayers prioritize spending at the end of the fiscal year to generate additional deduction opportunities. However, such behavior depends on taxpayers' understanding of the tax system and ability to plan ahead, and should therefore be related to mental accounting. Conversely, prior work suggests that individuals are more likely to evade taxes if they perceive them as being paid "out of their pocket" (Muehlbacher & Kirchler, 2013).

2.5. Research questions

Since prior work on mental accounting of taxes is scarce and often produced inconsistent results, further research is necessary. Little is known about the prevalence of mental accounting practices in the field and its correlates with personality and business characteristics. Moreover, prior studies dealt either solely with income tax, or with VAT, or did not differentiate between the different types of taxes. So far, the literature has investigated the effects of mental accounting on tax evasion, but not on tax planning. The present study adds to the existing literature by addressing these research gaps in a survey of self-employed taxpayers from Austria and Germany. More specifically, we examine five preregistered research questions:

- (1) Are there interindividual differences in mental accounting?
- (2) Are there differences between mental accounting of income tax and VAT?
- (3) What is the relation between tax knowledge and mental accounting?
- (4) Do business and personality characteristics relate to mental accounting?
- (5) Are the abovementioned constructs correlates of intended tax compliance behavior?

First, we investigate interindividual differences in mental accounting. We test whether self-employed taxpayers in the field vary in their mental accounting practices. We expect to observe (i) segregators, who mentally separate the tax due from other revenue and keep a separate mental account for taxes, and (ii) integrators who do not differentiate between gross and net income and enter all financial activities into a single mental account.

Second, we investigate whether using mental accounting depends on the type of tax. VAT is relatively easy to determine, it is usually explicitly indicated on invoices, and widely perceived as being paid by the customer. This should initiate the mental segregation of VAT. In contrast, income taxes are paid by the business owner and the segregation of future income tax payments is more difficult, because it is more complicated to determine the tax base. Consequently, we expect that taxpayers are more likely to create a separate mental account for VAT than for income taxes.

Third, we analyze the relationship between mental accounting and tax knowledge. For self-employed taxpayers, determining the correct amount of taxes requires fundamental knowledge of tax law. This raises the question whether some aspects of mental accounting as measured by the scale used in our study (e.g., saving sufficient amounts of money for future tax payments) merely stem from better tax knowledge. By contrast, we assume that mental accounting reflects – to some extent – a personality characteristic of taxpayers. We thus investigate how mental accounting relates to tax knowledge and whether these two constructs are distinct.

Fourth, we analyze the relationship of a number of personality and business characteristics with mental accounting to understand under what circumstances business owners use mental accounting of taxes. We assume that keeping a mental account for future tax payments and not spending that money requires a high degree of self-control (i.e., high conscientiousness, low impulsivity, and long-time rather than short-time orientation). Further, we assume that taxpayers must be able and willing to segregate the tax due and analyze whether mental accounting is related to financial literacy and to attitudes towards taxes. Regarding business characteristics, we explore how professional success – in terms of profits in the last three years, and financial scarcity – and perceptions of the administrative burden are related to mental accounting. Further, we correlate mental accounting scores with taxpayers' experience (years in business) to analyze whether mental segregation may result from learning processes.

Finally, we investigate how mental accounting and business and personality characteristics relate to self-reported tax planning as well as tax evasion. If mental accounting facilitates money management (Antonides et al., 2011), mental segregators should know better how to legally reduce their tax burden and thus exhibit higher levels of tax planning. Hence, we expect a positive relation between mental accounting and tax planning. On the other hand, we expect a negative relationship between mental accounting and tax evasion. Mental integration – not separating taxes due from other revenue – would lead to the feeling of paying tax out of one's pocket and fuel the feeling of losing money by complying with the law (Muehlbacher & Kirchler, 2013). Hence, mental integration should go along with a higher propensity to evade than mental segregation. In line with previous studies we further assume a positive relationship of knowledge about taxes and financial literacy with tax planning, and a negative relationship of tax knowledge and financial literacy with intentions to evade (Eriksen & Fallan, 1996; Kirchler & Maciejovsky, 2001). We anticipate a stronger propensity to evade and more tax planning among self-employed taxpayers who perceive a high administrative burden and hold negative attitudes toward taxes (Alm & Torgler, 2006). Moreover, we expect lower levels of compliance among individuals with cash flow problems (financial scarcity) and little experience (years self-employed).

3. Method

3.1. Participants and procedure

A total of 350 self-employed taxpayers participated in the study. Data were collected in Austria ($n = 72$; 21%) and Germany ($n = 278$; 79%).² Mean age was 50.28 years ($SD = 11.62$) and 229 (65%) participants were male. Our sample comprised micro-enterprises from different branches, with a median of one employee ($IQR = 3$) and a median annual turnover of 60,000 Euro ($IQR = 10,000$). The average duration of self-employment was $M = 15.35$ years ($SD = 10.92$).

The online questionnaire was distributed by the Austrian market research company Wissma Marktforschungs GmbH among taxpayers who met inclusion criteria (self-employed, subject to income tax and VAT in Austria or Germany). Inclusion criteria were screened in the survey's first section. If participants did not meet the criteria, they were redirected to a screen-out. The response rate was 50% with a completion rate of 81%. Data collection took place in February 2017.

Given the restrictions imposed by the inclusion criteria, it was not possible to use representative sampling quotas. However, sex ratio and mean age in our sample are comparable to census data with a male ratio of 65% and 67% in Austria and Germany, respectively, and median age in the range of 45 to 55 years in both countries (Statistik Austria, 2017; Statistisches Bundesamt, 2016).

3.2. Material

The instrument comprises Likert-type scale items with an answering format from 1 (= minimum value, e.g., *does not apply at all*) to 7 (= maximum value, e.g., *fully applies*). The questionnaire was divided into twelve sections.

Section one collected basic socio-demographic data (age, sex, nationality, employment status, job title, net income, and highest education level), tax residency, and qualification for VAT registration.

Section two assessed tax knowledge based on self-reports (adapted from Sakurai & Braithwaite, 2003, e.g., "I feel competent with regard to taxes."). Furthermore, participants were asked to what extent they are involved in their tax accounting (i.e., "To what extent are you involved in your tax accounting?") and tax filing (i.e., "Who usually prepares your tax return?").

Section three measured the tendency to apply mental accounting in a general tax context (e.g., "I know exactly how much money I have to save for future tax payments."), with regard to income tax (e.g., "I save money for potential additional income tax payments."), and VAT (e.g., "I save money for the advance VAT return."). Most of the mental accounting items used were developed by Muehlbacher and Kirchler (2013) and adapted for the context of the present study. Items that specifically referred to income tax and VAT were constructed as parallel as possible, in order to ensure comparability. We randomized the order regarding the income tax and VAT items so half of the participants were first presented with the items on income tax, while the other half were first presented with the items on VAT.

Section four assessed the administrative burden of paying taxes in general (e.g., "I think the tax system is too complex.") and separately for income tax and VAT (e.g., "The administration of income tax/VAT is complex.>").

Section five measured motivations to comply with tax law separately for income tax and for VAT. In line with Kirchler and Wahl (2010), we differentiated between motivations of voluntary and enforced tax compliance.

Section six covered tax planning (e.g., "I try to pay as little tax as legally possible") and captured individuals' intentions to legally minimize their tax liability. The respective items were developed for the present study.

Section seven assessed various aspects of tax evasion. We first measured the perceived compliance norm (e.g., "Think about other businesses in your field: How likely is it that businesses do not collect VAT from their customers?"), followed by individuals' willingness to evade taxes (e.g., "How likely are you to declare less income than you have actually earned?"). Again, the respective items were developed for the present study.

Section eight addressed tax authorities' enforcement capacity. We measured perceived audit probability and severity of fines for noncompliance.

Section nine asked individuals to indicate their personal attitudes toward taxes (e.g., "Paying tax is the right thing to do"). Items comprised the motivational postures' subscale *commitment*, defined as the moral obligation to pay taxes and to support the principles of taxation (Braithwaite, 2003; Braithwaite, Murphy, & Reinhart, 2007; Tan & Braithwaite, 2018).

Section ten measured participants' financial literacy. Items originated from Atkinson and Messy (2012). Based on recent results of a representative survey of the Austrian population (Silgoner, Greimel-Fuhrmann, & Weber, 2015), we used only the six most difficult items (e.g., "If interest rates rise, what will typically happen to bond prices? (a) They will rise, (b) they will fall, (c) they will stay the same, (d) there is no relationship between bond prices and the interest rate.>").

Section eleven comprised three short-scales on personality characteristics previously found to relate to mental accounting (Antonides et al., 2011; Muehlbacher & Kirchler, in preparation). These were *conscientiousness* of the BFI-10 (Rammstedt & John, 2007; e.g., "I see myself as someone who does a thorough job."); *non-planning impulsivity* of the BIS-15 (Meule, Vögele, & Kübler, 2011; Spinella, 2007; e.g., "I plan for the future." [reversed]); and *short-time orientation* adapted from Antonides et al. (2011; e.g., "I focus only on the short term.>").

² Note that the general administrative procedures of taxes for small business owners (especially in the case of income tax and VAT) are almost identical in Austria and Germany. Notwithstanding, we do control for possible country differences in the analyses.

Section twelve concluded the survey with questions on business characteristics such as turnover, number of employees, typically applied VAT rate, year of foundation, legal form, and financial scarcity.

3.3. Empirical strategy

(1) To explore interindividual differences in mental accounting, we analyzed the distribution of mental accounting scores. More specifically, we first tested for non-normality (Shapiro & Francia, 1972) and multimodality (Hartigan & Hartigan, 1985), followed by a latent profile analyses (Oberski, 2016) to identify possible latent sub-groups. (2) To detect differences between mental accounting of income tax and VAT we ran a *t*-test for dependent samples. (3) We used correlations to test the association between tax knowledge and mental accounting. To test whether the two constructs are conceptually different, we investigated the proportion of shared variance and conducted a confirmatory factor analyses (CFAs). (4) To analyze the relationship of personality and business characteristics with mental accounting, we conducted a series of regression analysis. (5) Finally, we regressed intended tax evasion and self-reported tax planning on the abovementioned constructs to identify correlates of intended tax compliance behavior.

4. Results

Presentation of results follows the sequence of preregistered research questions,³ followed by further exploratory analyses. Table 1 provides descriptive statistics for key constructs. Principal component analyses (PCAs) that guided the computation of scale scores are reported in the supplement (Tables S1 through S12). Importantly, PCAs yielded four mental accounting factors; *thinking about taxes* (e.g., “When I earn money I automatically think about the taxes due”), *saving for taxes* (e.g., “I don’t spend money I saved for future tax payments on other things”), *mental accounting of income tax* (e.g., “I save money for potential additional income tax payments”), and *mental accounting of VAT* (e.g., “I save money for the advance VAT return”). The first two factors are in line with the structure observed in previous research (Muehlbacher & Kirchler, 2013), which did not differentiate between income tax and VAT (factors three and four).

The main analyses are divided into five subsections, one for each research question. First, we investigated interindividual differences in mental accounting. Second, we tested for differences in mental accounting of income tax and VAT. Third, we assessed to what extent tax knowledge correlates with and discriminates against mental accounting. Fourth, we tested the association of business and personality characteristics with mental accounting. Finally, we investigated how the introduced constructs relate to intended tax behavior.

4.1. Research question 1: interindividual differences in mental accounting

Our first research question addressed interindividual differences in mental accounting. In line with prior work (e.g., Adams & Webley, 2001; Muehlbacher & Kirchler, 2013; Muehlbacher et al., 2017; Webley et al., 2006), we tested whether there are self-employed taxpayers who score high in mental accounting (i.e., segregators), who mentally separate the tax due from other revenue and keep a separate mental account for taxes, and those who score low (i.e., integrators), who do not differentiate between gross and net income and enter all financial activities into a single mental account.

Fig. 1 displays density distributions of all four mental accounting scores and suggests the possibility of different mental accounting types. A non-negligible number of scores are located at the scales’ upper end, and distributions exhibit multiple smaller peaks. Regarding the factor *saving for taxes*, there are two modes of similar size, one around the scale’s mid-point (4) and another in its upper end (6). Taken together, density distributions suggest mental accounting scores are not distributed normally.

To identify differences in mental accounting, we used a Shapiro-Francia test of non-normality (Mbah & Paothong, 2015; Shapiro & Francia, 1972) and a Hartigan’s dip test of multimodality (Hartigan & Hartigan, 1985). Results of these tests (presented in Table S13) support the graphical evidence. The Shapiro-Francia test indicated violations of normality for all four scores. Additionally, the Hartigan’s dip test attested more than one mode for all four mental accounting factors. To further corroborate our findings and identify potential latent sub-groups, we ran a latent profile analysis (Oberski, 2016) for all four mental accounting scores.

Table 2 depicts results of the latent profile analysis. We compared three solutions with each other, limiting the number of clusters extracted to one, two, and three, respectively. Aiming at identifying interindividual differences between mental integrators versus segregators, we expected the two-cluster model to have the best model fit. Column two presents the Bayesian information criterion (BIC) as a model fit indicator. The best fit is expressed by the highest BIC among compared models (Fraley, Raftery, & Adrian, 2007),⁴ confirming a two-cluster solution.⁵ We conclude it is likely that taxpayers in the field practice mental accounting to different degrees.

Result 1: Taxpayers differ in their mental accounting practices.

³ See <https://osf.io/sj9yk/> for the preregistration and <https://osf.io/fq8ne/> for materials and data.

⁴ In most model comparison approaches, lower BIC indicates better model fit. However, this depends on how the BIC is calculated. In the used R package (mclust; Fraley, Raftery, Scrucca, Murphy, & Fop, 2017), higher BIC expresses better model fit.

⁵ See Fig. S1 for the distribution of mental accounting scores by cluster.

Table 1
Overview of key constructs' scale characteristics.

Construct	No. of items	M	SD	Cronbach's α
Mental accounting				
Thinking about taxes	5	4.73	1.34	0.78
Saving for taxes	4	4.83	1.30	0.71
Income tax	3	4.39	1.69	0.85
VAT	3	4.82	1.59	0.75
Tax knowledge	5	4.18	1.56	0.89
Conscientiousness	2	5.18	1.20	0.26 ^a
Impulsivity	3	3.14	1.35	0.85
Short-time orientation	4	4.01	1.23	0.65
Attitudes toward taxes	8	4.67	1.38	0.88
Tax evasion	7	2.07	1.41	0.89
Tax planning	4	5.29	1.42	0.80
Financial literacy	6	3.76	1.53	0.56
Administrative burden	9	4.76	1.39	0.90

Note. $N = 350$. Items for all constructs but financial literacy had an answering format ranging from 1 to 7.

^a In light of the low reliability of the two-item conscientiousness score, we calculated all analyses separately with the two-item score and each single item, respectively, obtaining robust results.

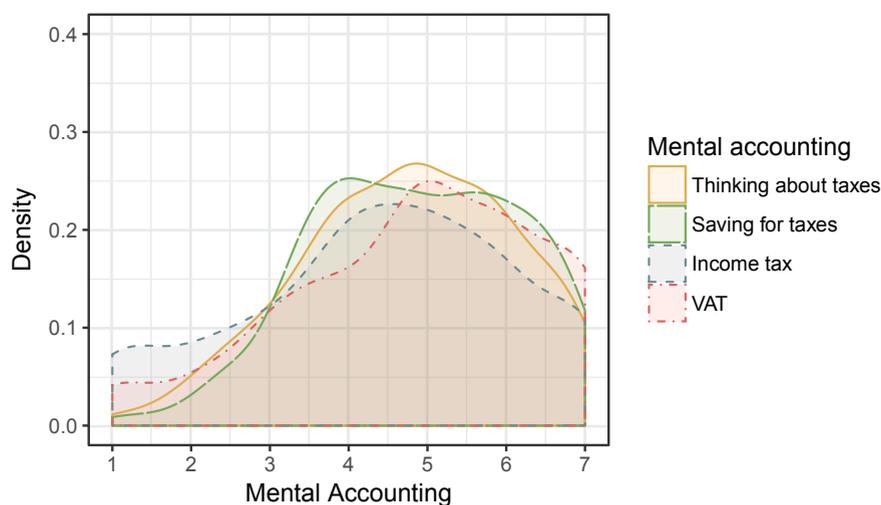


Fig. 1. Density distributions of all four mental accounting scores.

Table 2
Latent profile analysis of mental accounting scores.

Solution	BIC	Cluster	n	Mental accounting			
				Thinking about taxes	Saving for taxes	Income tax	VAT
				M (SD)	M (SD)	M (SD)	M (SD)
1 cluster	-4520.709	Cluster 1	350	4.73 (1.78)	4.83 (0.60)	4.39 (1.15)	4.82 (0.93)
2 clusters	-4407.371	Cluster 1	190	4.51 (2.01)	4.59 (0.56)	3.76 (0.92)	4.39 (0.89)
		Cluster 2	160	5.08 (1.23)	5.20 (0.46)	5.36 (0.80)	5.48 (0.78)
3 clusters	-4454.711	Cluster 1	31	4.11 (0.20)	3.92 (0.04)	3.91 (0.07)	3.97 (0.06)
		Cluster 2	141	4.24 (2.62)	4.35 (0.48)	3.15 (0.92)	3.83 (0.72)
		Cluster 3	178	5.26 (1.04)	5.39 (0.19)	5.54 (0.37)	5.81 (0.29)

Note. $N = 350$. BIC = Bayesian information criterion.

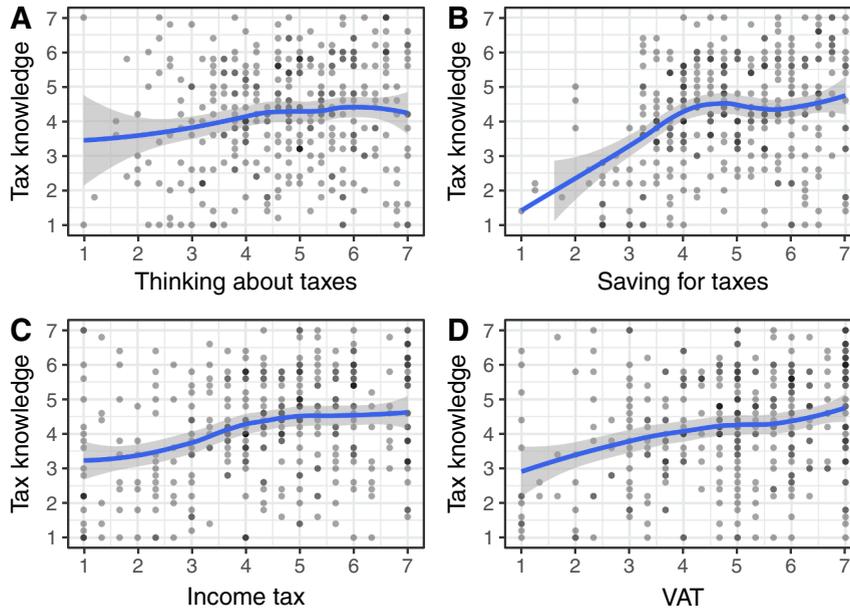


Fig. 2. Scatterplots for associations of the four mental accounting factors (x-axis) with tax knowledge (y-axis). Multiple observations appear as darker points.

4.2. Research question 2: differences between mental accounting of income tax and VAT

To identify differences between mental accounting for income tax and VAT, we first calculated the correlation between the two scales and then performed a dependent samples *t*-test. As can be expected, high correlation was observed, with $r = 0.74$, $p < .001$. However, score comparison revealed that absolute levels differed significantly within individuals, $t(349) = 6.72$, $p < .001$, Cohen's⁶ $d_{rm} = 0.26$, with $M_{IncomeTax} = 4.39$ ($SD = 1.69$) and $M_{VAT} = 4.82$ ($SD = 1.59$).⁷

These results align with our assumption that mental segregation is easier for VAT. However, given the large correlation between scores and small effect size, it seems more relevant that individuals who mentally segregate VAT also segregate income taxes. Correlates of the two mental accounting scores with further constructs are reported below (see research question 4).

Result 2: Taxpayers are more likely to keep a separate mental account for VAT than for income tax. However, this effect is relatively small.

4.3. Research question 3: tax knowledge and mental accounting

We used correlations to initially explore the relation between tax knowledge and mental accounting. Correlations between the four mental accounting scores and tax knowledge are depicted in Table S14 and Fig. 2. All correlations were significant and ranged from $r = 0.14$ to $r = 0.30$, suggesting meaningful relations.⁸ However, discriminant validity cannot be judged based on this information.

A common technique to investigate discriminant validity between two factors (e.g., A and B) is to compare the average variance extracted (AVE) for each factor (i.e., average squared factor loadings of items on factor) with the shared variance of both constructs (i.e., squared correlation between A and B) to test whether each factor explains more variance than the two constructs share. If AVE for A and for B are both larger than their shared variance, discriminant validity is supported (Farrell, 2010; Fornell & Larcker, 1981; Hair, Black, Babin, & Anderson, 2014). Table S14 shows that this is the case for all comparisons between mental accounting factors and tax knowledge. For instance, AVE for the mental accounting factor *thinking about taxes* was 0.45 and for *tax knowledge* 0.61. The squared correlation for these two factors was 0.02. Therefore, discriminant validity for all mental accounting factors and tax knowledge can be assumed.

Additionally, we ran confirmatory factor analyses (CFAs) to test whether the different mental accounting measures and tax

⁶ Cohen's d_{rm} refers to the standardized mean difference for repeated measures, which factors in the correlation between two variables (Lakens, 2013; Morris & DeShon, 2002).

⁷ The difference of the two scores was not normally distributed which is a violation of assumption for conducting a *t*-test for dependent samples. A non-parametric Wilcoxon signed rank test confirmed the reported result, $Z = -6.72$, $p < .001$.

⁸ All but one of the relationships remain significant when holding other relevant constructs constant (see Table 4 for details).

Table 3
CFA investigating discriminant validity between mental accounting factors and tax knowledge.

Included items		Single-factor model				Two-factor model			
Mental accounting	Tax knowledge	CFI	TLI	BIC	SRMR	CFI	TLI	BIC	SRMR
Thinking about taxes (<i>n</i> = 5)	Tax knowledge (<i>n</i> = 5)	.63	.53	13,357	.18	.93	.91	12,900	.07
Saving for taxes (<i>n</i> = 4)	Tax knowledge (<i>n</i> = 5)	.78	.70	11,765	.13	.93	.91	11,564	.07
Income tax (<i>n</i> = 3)	Tax knowledge (<i>n</i> = 5)	.62	.50	12,084	.16	.95	.93	11,555	.06
VAT (<i>n</i> = 3)	Tax knowledge (<i>n</i> = 5)	.74	.66	12,048	.14	.95	.93	11,775	.06

Note. *N* = 350. The CFA solutions take into consideration all items contributing to the factors. CFI = comparative fit index. TLI = Tucker-Lewis index. BIC = Bayesian information criterion. SRMR = standardized root mean square residual. χ^2 -model comparisons between each single- and two-factor model confirmed significantly higher model fit for all four two-factor models (untabulated).

knowledge are distinct constructs. If so, two-factor solutions should yield better model fits than single-factor solutions. For the four single-factor CFA solutions, all items contributing to one mental accounting score and to the tax knowledge score were restricted to one single latent factor. The two-factor CFA was set to discriminate between mental accounting and tax knowledge items. We compared the single-factor models against the two-factor solutions to assess which models fit the data best. The absolute two-factor model fit was additionally assessed by cut-off criteria (Hu & Bentler, 1999). We considered the comparative fit index (CFI), the Tucker-Lewis index (TLI), and the standardized root mean square residual (SRMR). CFI and TLI values of 0.95 or greater and SRMR values of 0.08 or below suggest good model fit (Brown, 2015; Hu & Bentler, 1999).

Results are provided in Table 3. For two-factor models, CFI and TLI values were close to these benchmarks and all SRMR values were below 0.08. These results suggest that the two-factor model is satisfactory, but not optimal. However, comparisons of two-factor solutions with single-factor models clearly show that two-factor models yielded higher model fits, suggesting that mental accounting and tax knowledge are distinct constructs.⁹

Taken together, our data suggest that certain facets of mental accounting relate to tax knowledge, yet two different latent constructs seem to underlie the two factors. Descriptively, Fig. 2 indicates that mental accounting increases with tax knowledge, but both factors appear unrelated once a certain level of knowledge is reached.

Result 3: Mental accounting and tax knowledge are related but distinct constructs.

4.4. Research question 4: relations of personality and business characteristics with mental accounting

To examine how personality and business characteristics relate to mental accounting, we conducted regression analyses with each mental accounting score as dependent variables (Table 4). Correlations between the most relevant variables are presented in Table S15. Sex, age, and country were unrelated to all mental accounting scores. Regarding personality factors, impulsivity was negatively related to all four mental accounting factors, suggesting that highly impulsive taxpayers use mental accounting to a lesser extent. Short-time orientation related to *saving for taxes*, short-time oriented taxpayers indicated to save less for future tax payments. Positive attitudes towards taxes were positively related to *saving for taxes*, *mental accounting of income tax and VAT*, but not to *thinking about taxes*. Contrary to our expectations, neither financially literate taxpayers nor more experienced business owners expressed higher tendencies to practice mental accounting. Business prosperity (financial scarcity), was negatively related to *saving for taxes*, *mental accounting of income tax*, and *VAT*, indicating that business owners with lower financial means separate taxes less often.

In summary, impulsivity related negatively to all types of mental accounting, while positive attitudes and low financial scarcity were associated with the factors *saving for taxes*, *mental accounting of income tax and mental accounting of VAT*. Our models explain 32% of variance for *saving for taxes* and around 20% of variance of *mental accounting of income tax and VAT*. For *thinking about taxes*, only 9% of variance could be explained. Hence, our models seem to explain self-reported behavior (*saving for taxes*) more successfully than cognition (*thinking about taxes*).

Result 4: Mental accounting is related to lower impulsivity, higher attitudes towards taxes, and lower financial scarcity.

4.5. Research question 5: correlates of intended tax behavior

We ran two regression models with intended tax evasion and self-reported tax planning as dependent variables (Table 5). Independent variables were the same as in models predicting mental accounting practices (research question 4), extended by an aggregated mental accounting score,¹⁰ tax knowledge, and tax burden perceptions.

Regarding tax evasion, different levels of mental accounting were not related to self-reported willingness to evade taxes. Likewise,

⁹ Note that in this case, lower BIC values indicate better model fit.

¹⁰ To reduce the number of highly correlated mental accounting predictors in a single model, we computed one single mean mental accounting score that was entered as predictor variable. Models with each of the four specific mental accounting factors are provided in Tables S16 and S17 of the supplementary material and do not differ from the aggregated model presented here in single predictors' significance.

Table 5
Regression table for tax evasion and tax planning as dependent variables.

Variables	Tax compliance intentions							
	Tax evasion				Tax planning			
	<i>B</i>	β	<i>SE</i>	<i>p</i>	<i>B</i>	β	<i>SE</i>	<i>p</i>
Intercept	2.74		.78	< .001	2.09		.86	.015
MA: Aggregated score	0.01	.01	.06	.863	0.28	.24	.07	< .001
Sex	0.19	.07	0.14	.171	0.25	.08	.15	.109
Age	0.00	-.04	0.01	.480	0.01	.07	.01	.248
Country	0.04	.01	0.16	.785	0.14	.04	.17	.417
Conscientiousness	-0.25	-.25	0.06	< .001	0.07	.06	.07	.287
Impulsivity	-0.10	-.11	0.06	.069	-0.08	-.08	.06	.175
Short-time orientation	0.18	.18	0.05	< .001	0.07	.06	.06	.220
Attitudes toward taxes	-0.11	-.12	0.05	.024	-0.22	-.22	.05	< .001
Financial literacy	-0.04	-.06	0.04	.315	0.21	.23	.05	< .001
Years self-employed	0.01	.05	0.01	.388	0.00	.02	.01	.782
Profit in last three years	-0.01	-.01	0.04	.828	0.04	.06	.04	.278
Financial scarcity	0.12	.17	0.05	.008	-0.05	-.06	.05	.322
Tax knowledge	0.04	.06	0.04	.320	0.04	.05	.05	.359
Administrative burden	0.09	.10	0.05	.065	0.18	.17	.05	< .001
	$F(14, 331) = 5.94, p < .001,$ Adjusted $R^2 = 0.17$				$F(14, 331) = 8.62, p < .001,$ Adjusted $R^2 = 0.24$			

Note. $N = 346$. MA = mental accounting. Variance inflation factors were between 1.11 and 1.64 (both models).

coefficients for sex, age, and country were not significant. Taxpayers with high conscientiousness and low short-time orientation scores reported lower intentions to evade. Negative attitudes towards taxes were associated with higher willingness to evade. Financial literacy, years of business experience, profit in the last three years, tax knowledge, and perceived administrative burden were unrelated to intentions to evade taxes. However, self-reported financial scarcity was associated with higher willingness to evade taxes.

Result 5a: Intended tax evasion is related to lower conscientiousness, higher short-time orientation, lower attitudes towards taxes, and higher financial scarcity.

Regarding tax planning, we found a significant association between mental accounting and tax planning, where taxpayers with higher mental accounting scores reported more tax planning. Again, sex, age, and country showed no significant effect. Likewise, coefficients for conscientiousness, impulsivity, and short-time orientation were insignificant. Taxpayers with negative attitudes towards taxes and high financial literacy reported higher levels of tax planning. While business experience, financial scarcity, and tax knowledge did not significantly relate to tax planning, higher levels of tax planning were related to higher levels of perceived administrative burden.

Result 5b: Tax planning is related to higher mental accounting, lower attitudes towards taxes, higher financial literacy, and higher perceived administrative burden.

4.6. Additional exploratory analyses

We conducted a number of additional analyses to further explore our data. More specifically, we analyzed associations between mental accounting and taxpayers' involvement in filing taxes and motives to comply. Furthermore, we investigated differences between individuals with and without VAT obligations and explored the role of mental accounting as a mediator between personal and business characteristics and intended compliance behavior. Reported findings aim to stimulate future research and should not be interpreted inferentially.

First, we were interested in whether mental accounting practices depend on the extent taxpayers are personally involved in their tax accounting and tax filing. To explore this question, we correlated a single-item measure on tax accounting ("To what extent are you involved in your tax accounting?") with the four mental accounting scores. Additionally, we asked participants to indicate who filed their tax returns (e.g., "I by myself"; "I with my tax preparer"; "My tax preparer"; etc.). We recoded these options to indicate whether individuals were somehow involved in the filing process and correlated this indicator with the four mental accounting scores. Table S18 shows that filing taxes is not related to mental tax accounting in our sample. Involvement in tax accounting, on the other hand, was somewhat related to saving for future tax payments, but point estimates are small.

Second, our primary analyses did not address motivations for paying taxes. The literature frequently distinguishes between voluntary and enforced compliance (Kirchler, 2007). We used items from the TAX-inventory (TAX-I; Kirchler & Wahl, 2010) to assess both types of compliance, and one question on whether individuals pay taxes voluntarily or because they feel forced to. TAX-I items

were adapted to address income tax and VAT specifically. Therefore, we correlated tax-specific mental accounting scores with tax-specific voluntary and enforced compliance variables. For income tax, mental accounting correlated positively with voluntary compliance, $r(348) = 0.32, p < .001$, indicating that, in our sample, taxpayers who segregate income tax from their business turnover report higher levels of voluntary compliance. Enforced compliance, however, did not relate to mental accounting of income tax, $r(348) = 0.07, p = .212$. The pattern for VAT was the same, with a positive correlation of $r(348) = 0.23, p < .001$, between mental accounting and voluntary compliance, and no significant relationship for enforced compliance, $r(348) = 0.03, p = .538$. The single-item on whether individuals pay taxes voluntarily or because they feel forced to revealed that the mental accounting factor *thinking about taxes* was not related to a specific motive, $r_s = 0.08, p = .136$, while *saving for taxes* was related to a higher degree of voluntary motives, $r_s = -0.18, p < .001$.

Third, one sampling inclusion criterion was that participants owned businesses subject to VAT. However, the market research company also collected data from individuals without obligation to collect VAT. We obtained data from $n = 350$ individuals meeting all inclusion criteria, and from $n = 133$ additional taxpayers with businesses subject to income tax, but not VAT. This provided us with the opportunity to explore whether collecting VAT *per se* is associated with mental accounting practices. We assume that the collection of VAT aggravates administrative burden, increases taxes' visibility and hence also the perception of having to put money aside for future tax payments. We compared mental accounting factors *thinking about taxes*, *saving for taxes*, and *mental accounting of income tax* between the two groups. Because variances were unequal in all three comparisons, we conducted Welch's tests. Results were $t(210) = 3.19, p = .002$, Cohen's $d_s = 0.32$, for *thinking about taxes*, $t(230) = 2.11, p = .040$, Cohen's $d_s = 0.21$, for *saving for taxes*, and $t(210) = 3.03, p = .003$, Cohen's $d_s = 0.31$, for *income tax*, suggesting a stronger tendency towards mental segregation among taxpayers subject to VAT.

Fourth, regression results explaining mental accounting (Table 4) and intended tax behavior (Table 5) imply that the relationship between a given personality or business characteristic and intended tax behavior could be mediated by mental accounting. For instance, low impulsivity explains mental accounting (Table 4), which in turn explains intended tax planning (Table 5). As cross-sectional questionnaire data does not allow identifying causal effects, this analysis aims to identify potential relationships which should be tested experimentally or longitudinally in future studies. We ran mediation analyses for all variables that were significantly correlated with mental accounting. A detailed report is provided in the [supplementary materials \(Tables S19 and S20\)](#). In summary, for intended tax evasion we found a mediation effect of mental accounting for tax knowledge, impulsivity, and profit in the last three years. This indicates that, for instance, tax knowledge might increase mental accounting which in turn reduces tax evasion. For tax planning, we observed a mediation effect of mental accounting for tax knowledge, conscientiousness, impulsivity, attitudes toward taxes, profit in the last three years, and financial scarcity.

5. Discussion

The present study reveals interindividual differences in mental accounting practices among self-employed business owners. We find that individuals who score high on mental accounting (segregators) state that they perceive taxes as separate from their business turnover and indicate to put aside sufficient funds for future tax payments. Individuals who score lower on mental accounting (integrators), on the other hand, perceive taxes as part of their business turnover to a stronger degree.

Despite significant mean differences, we find that mental accounting scores for income tax and VAT are strongly related. We do confirm that mental segregation of VAT is stronger, but the effect size is small. Given the large correlation between mental accounting of the two taxes, it seems that individuals applying mental accounting to one tax are also likely to apply it to others. Exploratory analysis reveals that individuals who have to administer VAT indicate higher levels of mental accounting than taxpayers not subject to VAT. Hence, future studies should investigate whether administrative obligations facilitate the segregation of taxes from business turnover and how tax design influences taxpayers' perceptions.

With regard to taxpayers' personality, for tax knowledge and mental accounting, we find small correlations, but at the same time structural differences. Being knowledgeable increases the likelihood of maintaining a mental tax account, but separating future taxes from business turnover is not a direct consequence of having increased tax knowledge alone.

Thinking about future tax payments is predominantly related to impulsivity. Impulsive taxpayers are less likely to think about their future tax payments. They also state to save less for future tax payments. Moreover, positive attitudes toward taxes are related to high levels of mental accounting (cf. Muehlbacher & Kirchler, 2013). One key finding is that business owners experiencing financial scarcity are less likely to segregate taxes. In fact, this relationship was the strongest in the inferential analysis. This finding is in line with Muehlbacher et al. (2017) who found that individuals' personal tendency to practice mental accounting was negatively related to bankruptcy. Individuals who viewed taxes as separate from business turnover were less likely to run bankrupt in the experimental task. Regarding a directional interpretation, multiple explanations are feasible. Some businesses might not be financially prosperous enough to put money aside, lack of mental accounting might hinder business success, or mediation effects might lead highly impulsive individuals to spend earned money without considering future tax payments. Longitudinal field studies could disentangle these competing explanations.

In contrast to previous studies, our regression analysis did not reveal a direct effect of mental accounting on intended tax evasion. Whereas zero-order correlations indicate that individuals who save for future tax payments also report a lower likelihood of evading taxes, the regression results suggest that other factors are more relevant in explaining tax evasion. Specifically, low conscientiousness,

¹¹ Cohen's d_s refers to the standardized mean difference between two independent groups of the sample (Lakens, 2013).

short-time orientation, negative attitudes toward taxes, and financial scarcity were related to intended evasion. On the other hand, mental accounting was related to higher levels of tax planning, with effects of substantial size. Hence, individuals who are better at planning future tax payments and segregate taxes may find it easier to reduce their tax liability legally and thus do not have the necessity to evade taxes. In line with this interpretation is the finding that negative attitudes toward taxes, high financial literacy, and higher perceived administrative burden correlate with higher levels of tax planning. Our exploratory mediation analysis suggests a more complex relation of mental accounting and tax compliance, where mental accounting might act as a mediator between various personality and business characteristics and tax behavior. For instance, our data implies that low impulsivity increases mental accounting, which in turn increases intended tax planning. Future studies should test these effects causally.

Considering levels of intended tax evasion, we find that the vast majority of participants does not indicate to evade taxes. This could partly be attributed to socially desirable responses (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Randall & Fernandes, 1991). The resulting lack of variance could explain why we failed to find a robust relationship between mental accounting and tax compliance. However, if such low levels of intended tax evasion were valid, the results support many authors' broader conclusions (e.g., Alm & Torgler, 2011; Eriksen & Fallan, 1996; Onu & Oats, 2016; Wenzel, 2005), who challenge the paradigm of profit-maximizing rational taxpayers (Allingham & Sandmo, 1972) and suggest that business owners' tax behavior is most likely influenced by ethical considerations.

The present study is prone to typical limitations of cross-sectional questionnaire study designs. Hence, proof of causality for the identified relationships cannot be provided (Kenny, 1979), and common method bias, especially measurement context effects and common rater effects, could have inflated covariance between sets of variables (Podsakoff et al., 2003; Randall & Fernandes, 1991). Moreover, the relationship between self-reported and actual compliance behavior is sometimes contested. A positive relationship between intended and actual compliance has previously been confirmed (Hite, 1988), but also challenged (Elffers, Robben, & Hessing, 1992; Webley et al., 2006; Weigel, Hessing, & Elffers, 1987). To account for these issues to some extent, the questionnaire repeatedly emphasized that full anonymity was guaranteed.

One of the study's key strengths is that it surveys self-employed taxpayers, a population usually difficult to sample. Research within this group is especially important because they have extensive possibilities to evade and circumvent taxes (Feinstein, 1991; Kirchler, 2007; Kleven et al., 2011) and are often considered a compliance risk group (Engström & Holmlund, 2009). Our results add to the understanding of interindividual differences between self-employed taxpayers. Moreover, the present questionnaire uses established scales from the tax literature, along with novel, context-specific items measuring previously rather neglected aspects (e.g., scarcity). In tax research, most studies control for available monetary funds by including an income estimate in the analysis. Analyzing financial scarcity provides an interesting additional perspective, as it incorporates differences in fixed costs and other financial commitments that affect tax compliance.

A relevant finding for policy makers is that mental accounting is negatively related to financial scarcity or – in turn – business success. Future research should clarify the causal direction of this effect, but if mental accounting leads to less scarcity and greater business success, young business owners should be educated in mental accounting (i.e., segregation) strategies. Furthermore, we find a positive link between mental accounting and tax planning. While we do not find a positive correlation between tax planning and business prosperity in our data, it is often argued that businesses that plan their tax payments well are more competitive. Providing taxpayer services and training young entrepreneurs might thus strengthen the competitiveness of their businesses.

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Appendix A. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.joep.2018.12.007>.

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