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When happy people make society unhappy: Emotions affect tax compliance behavior☆

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ABSTRACT

Emotions affect judgments and decision making. Our paper presents a study to show that incidental background emotions (i.e., emotions not related to the actual decision) influence individuals' tax compliance attitudes and behavior. A large-scale survey of 22,220 German taxpayers and a controlled laboratory experiment provide evidence that positive background emotions reduce willingness to comply compared to aversive (negative) background emotions. The participants in our survey show less favorable tax compliance attitudes on weekends, which are usually associated with more positive background emotions. These findings are supported by the results of a controlled laboratory experiment in which background emotions were induced by standardized pictures. Individuals choose to evade taxes more often after being exposed to positive emotions than after being exposed to aversive emotions.

1. Introduction

Emotions have a strong impact on our everyday lives. They affect our thoughts, judgments and, most importantly, our behavior and economic decisions, such as risk-taking behavior, financial investment decisions, and savings decisions (Au et al., 2003; Birru, 2018; Hirshleifer and Shumway, 2003; Kamstra et al., 2003), as well as our social interactions, cooperativeness, and generosity (Capra, 2004; Drouvelis and Grosskopf, 2016; Kirchsteiger et al., 2006). Emotions have also been found to play crucial roles in accounting (Boedker and Chua, 2013), financial reporting (Eskenazi et al., 2016), auditing (Guénin-Paracini et al., 2014), and tax accounting (Blaufus et al., 2017). For example, they influence managers' capital budgeting decisions (Kida et al., 2001), the judgment of auditors (Bhattacharjee and Moreno, 2002), and tax declaration decisions (Dulleck et al., 2016). Although there are a growing number of publications studying

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the economic effects of emotions across different accounting and taxation domains, theoretical and empirical studies are still scarce, especially in the domain of taxation (for a literature overview, see Repenning et al., 2022; Hanlon et al., 2022). The role of emotions in accounting research has been called 'a further overlooked feature' (Hall, 2016). Notably, in recent studies, the OECD proclaimed that behavioral insights, including emotions, can make a significant difference in the work of tax administration and can transform interactions with taxpayers, leading to increased compliance (OECD, 2021, 2022). Among other techniques, tax administrations use behavioral insight methodologies for compliance risk management.

Emotions arising while making a choice (e.g., completing a tax return) are coined *integral* emotions (Keltner and Lerner, 2010; Lerner et al., 2015). In contrast, background emotions that originate from surrounding experiences (e.g., leisure activities or weather), often unconsciously, and are not directly related to the actual decision are called *incidental* emotions (Keltner and Lerner, 2010; Lerner et al., 2015). Despite increasing interest in emotions and decision making, knowledge about emotions and their impact on tax decisions is surprisingly limited. Although integral emotions in the process of declaring and paying taxes have been investigated by a few studies (e.g., Blaufus et al., 2017; Dulleck et al., 2016), no study thus far has examined the impact of incidental background emotions on tax compliance. We contribute to the literature by showing that incidental emotions affect tax compliance attitudes and behavior.

Since the 1970s, research on tax compliance has mainly focused on the impact of deterrence mechanisms; citizens' understanding of tax law, tax knowledge, attitudes and tax morale; vertical and horizontal justice; and the interaction climate between tax authorities and taxpayers (e.g., Alm et al., 2010; Kirchler, 2007; Lewis, 1982; Torgler, 2002; Wenzel, 2002, 2004, 2005). In particular, the introduction of tax morale represents an important shift in the literature, as rational deterrence models often underestimate compliance and overestimate tax evasion (see Alm, 1999 and Torgler, 2002 for reviews). However, the role of emotions in tax decisions has rarely been studied. Erard and Feinstein (1994) propose a theoretical model for the role of emotions ("moral sentiments") in tax compliance decisions. According to their approach, two emotions—shame and guilt— play a central role;, both arising from imagined norm violations. Guilt and shame are specific aversive (negative) integral emotions that originate from actual behavior and the anticipated consequences and are found to increase willingness to comply. Dulleck et al. (2016) built on this idea and proposed a model that integrates "psychic stress", which basically refers to what Erard and Feinstein (1994) defined as guilt. To measure this aversive emotion in tax compliance decisions, they use heart rate variability. The authors observe a positive correlation between heart rate variability and tax compliance, suggesting that larger aversive emotional reactions do in fact lead to more tax compliance. Further support for the role of guilt and shame in tax compliance decisions was provided by Bosco and Mittone (1997) and Blaufus et al. (2017).

To date, the tax literature has focused on integral emotions resulting from actual tax activity, actual tax experience and anticipated consequences. Both theoretical and empirical work indicates that these emotions are likely to shape tax compliance behavior. Incidental emotions may impact tax decisions in addition to integral emotions, as they might interact with them. Before starting to file taxes, taxpayers may have received bad news and feel frustrated, angry or anxious, resulting in aversive (negative) incidental emotions, or they may have received good news, attended a successful meeting or relaxed on a weekend, resulting in positive incidental emotions. Although these emotions are not directly related to the actual tax decisions, i.e., not evoking from the actual choice problem, they might affect the current emotional status and, as a consequence, contemplation about honestly declaring income and deductions.

We provide important insights into the impact of incidental emotions on tax compliance intentions and behavior. We argue that incidental emotions alter behavior by shaping individuals' tax compliance attitudes and their willingness to take risks. In line with the additivity-of-affect hypothesis and the dual-emotion concept (Lerner et al., 2015; Neumann et al., 2001; Västfjäll et al., 2016), we argue that the evasion-inhibiting effect of aversive *integral* emotions (e.g., guilt and shame) is reduced by positive *incidental* emotions but amplified by aversive *incidental* emotions.[g] Moreover, as tax decisions are decisions under risk, we argue that positive incidental emotions also foster tax evasion by increasing the willingness to take risks (Au et al., 2003; Chou et al., 2007; Schulreich et al., 2014; Birru, 2018). Consequently, we hypothesize that positive incidental emotions lead to lower tax compliance than aversive incidental emotions.

Our research is in line with the growing stream of accounting research that investigates the behavioral economics of accounting and taxation (Hanlon et al., 2022). Individual behavior in tax compliance depends on not only pure economic incentives but also individual emotions. We contribute to and extend the tax compliance and tax morale literature (see Andreoni et al., 1998; Torgler, 2002; Hofmann et al., 2008; Alm, 2012; Slemrod, 2019, 2019 for excellent literature reviews) by addressing incidental emotions as a novel factor for tax compliance. In particular, we conducted two complementary studies: a large-scale survey study focusing on tax compliance attitudes and a laboratory experiment focusing on tax compliance behavior. Whereas the first study provides preliminary insights in line with our hypothesis, the second provides evidence supporting it. In the first study, we analyze data from a survey conducted by the Ministry of Finance of North Rhine-Westphalia (Germany) involving 22,220 taxpayers. Among other variables, tax compliance attitudes were measured (Alm, 2019; Alm and Torgler, 2006; Torgler, 2002). To provide the preliminary insights into the possible influence of incidental emotions on tax compliance, we compared compliance attitudes on days of the week usually associated with

[g] Imagine for example, a taxpayer has to make the choice to either evade taxes or not. Thinking of breaking the norm to declare taxes honestly, the taxpayer feels guilty, an unpleasant integral emotion that she typically wants to avoid. However, evading taxes would lead to some monetary gain. As a consequence, without any other influences the taxpayer might be indifferent between evading taxes or declaring them honestly. Now imagine the taxpayer had a stressful day at work. Several tasks did not work out as planned and the taxpayer is frustrated. In such an unpleasant incidental emotional state adding the feeling of guilt caused by evading taxes feels even more severe. The taxpayer definitely wants to avoid the resulting very bad emotional state. In contrast, after a quite successful day, the taxpayer might feel very happy. In such a happy incidental emotional state adding some feeling of guilt does not feel that severe and seems acceptable for the taxpayer.

positive emotions (weekend days and Friday) with attitudes on days usually associated with less positive emotions (weekdays, except for Friday; see Rossi and Rossi, 1977; Stone et al., 2012). In line with our hypothesis, on days associated with more positive incidental emotions, tax compliance attitudes were less favorable than on days associated with more aversive incidental emotions. The effect is statistically significant and economically meaningful: switching from days associated with more positive incidental emotions to days associated with less positive incidental emotions increases the tax compliance attitude by 2.27 percentage points (or for Germany, for example, up to 410,000 additional fully compliant tax returns). However, individuals who think that tax evasion is justified might have a tendency to participate on the weekend. We therefore introduced a second proxy for incidental emotions, namely, precipitation, assuming that background emotions are on average more negative on rainy days than on days on which there is no rain. We found that, on rainy days, individuals are less willing to evade taxes.

The second study addresses tax compliance behavior. After conducting a pilot study, we conducted a controlled laboratory experiment with 297 individuals. The design choices in this experiment were largely influenced by a study that did not find evidence in favor of an influence of incidental emotions on tax compliance behavior (Enachescu et al., 2021). We believe that their null finding was mainly caused by several additional sources of emotional reactions (i.e., real-effort tasks, identical decisions, feedback; see discussion below) that interfered with the emotional priming. We therefore aimed to minimize these effects. In our experiment, participants were asked to declare their income in a standard tax compliance game (Alm, 2019; Torgler, 2002). We used a standardized set of pictures that remained present during choosing to induce either positive or aversive incidental emotions in this game. As hypothesized, incidental emotions affected tax compliance behavior, suggesting that the observed variation in tax compliance attitude in Study 1 might be caused by variations in incidental emotions. Compliance after the induction of positive incidental emotions was approximately ten percentage points lower than that after the induction of aversive incidental emotions. The results replicate initial findings from a pilot experiment (see appendix A2). Overall, our two complementary studies, including different types of analyses (days of the week and precipitation) and datasets (survey and two experiments), provide robust empirical evidence that incidental emotions have a meaningful impact on tax decisions.

The remainder of this paper is structured as follows. In Section 2, we discuss the related literature, focusing on the experimental literature on tax compliance (e.g., Alm, 2012; Dulleck et al., 2016; Hofmann et al., 2008; Torgler, 2002) and risk-taking behavior (e.g., Au et al., 2003; Birru, 2018; Chou et al., 2007; Johnson and Tversky, 1983; Schulreich et al., 2014). In Section 3, we generalize the tax compliance model proposed by Erard and Feinstein (1994) to account for incidental emotions and develop our hypothesis. Section 4 presents the results of the survey study, and Section 5 presents the results obtained from the laboratory experiment. Section 6 concludes with practical implications.

2. Related literature

2.1. Tax morale and tax compliance behavior

The literature on tax compliance has highlighted the importance of moving beyond a neoclassical approach to understanding why citizens pay taxes. Allingham and Sandmo's (1972) influential model, which suggests that tax evasion decreases as the likelihood of detection and severity of punishment increase, has faced significant criticism (e.g., Graetz and Wilde, 1985; Alm, McClelland, and Schulze, 1992; Frey and Feld, 2002). One key point arising from empirical and experimental research is that these deterrence models often underestimate compliance and overestimate tax evasion (see Alm, 1999 and Torgler, 2002 for reviews). In many countries, the level of deterrence is insufficient to explain the high levels of tax compliance observed. Additionally, there is a notable disparity between reported levels of risk aversion and the necessary measures to ensure compliance. These studies provide robust evidence that tax compliance increases when tax morale increases (see Torgler, 2002; for the relationship between tax motivations and tax behaviors, see Gangl and Torgler, 2020).

However, tax morale is a highly variable trait that is influenced by several factors. For example, Frey and Torgler (2007) show that tax morale decreases if taxpayers believe tax evasion to be common in society. Furthermore, there is a rich body of literature relating patriotism to tax morale. Various studies have shown that feelings of national pride and identification with one's own country or local community are linked to higher tax morale. Research by Hartner, Rechberger, Kirchler, and Wenzel (2011), Konrad and Qari (2012), Torgler (2003, 2004, 2005), and Torgler and Schneider (2005) supports this idea. Data from the World Value Survey and the European Value Survey suggest that being proud of one's country is associated with greater tax compliance in regions such as Asia, Central and Eastern Europe, Austria, and Latin America. While these survey results are based on correlational analyses, recent studies have also investigated the role of patriotism in experimental settings. For example, Gangl et al. (2016) manipulated patriotism levels by displaying a national flag or national landscapes or by priming national achievements. The results indicate that these treatments indirectly increased tax morale by increasing patriotism. Importantly, except for the national flag, nationalism was not affected by these treatments. Along this line of research, Macintyre et al. (2023) exposed participants in Australia to patriotic priming videos. They found that priming through exposure to symbols of national pride and national identity had a positive effect on the level of tax compliance in Australians but not Non-Australians. The authors relate this effect to physiological markers identified using heart-rate variability analyses. Whereas iconic images activate the parasympathetic nervous system, sporting events activate the sympathetic nervous system. Importantly, both the study by Gangl et al. (2016) and the study by Macintyre et al. (2023) show that tax compliance attitudes (tax morale) and tax compliance behavior can be influenced by priming.

2.2. Integral emotions and tax compliance behavior

The specific emotions that have received the most attention in the tax context are shame and guilt. A quarter century ago, Erard and Feinstein (1994) proposed their theoretical model of the role of "moral sentiments" in tax compliance decisions. According to their model, shame and guilt emerge from the contemplation of imagined evasion actions and possible consequences. In this context, shame is related to the imagination of being caught and punished (e.g., anticipated regret). As an anticipated emotion, shame can be processed rationally as any other consequence of a decision (e.g., monetary fine). In contrast, guilt can arise independent of detection. Guilt can be viewed as an affective reaction to an intended violation of a legal or social norm that arises when contemplating a choice. In the tax context, legal and social norms might prescribe truthful declarations of one's own income. If taxpayers intend to evade taxes, their behavior conflicts with injunctive and/or descriptive norms, and violating norms is likely to elicit emotional reactions.

Both aversive shame and guilt are integral emotions that have moral costs in the case of tax evasion (e.g., Fortin et al., 2007; Traxler, 2010). Empirical studies provide robust evidence that tax compliance increases if moral costs increase. Kirchler (2007) suggests that anticipated emotions become "a cost factor in evaluating one's likely advantages and disadvantages of tax evasion" (p. 64). Therefore, it can be expected that a higher level of aversive emotions associated with potential noncompliance leads to higher moral costs and greater tax compliance. Erard and Feinstein (1994), for example, operationalized this effect via a reduction in the expected utility of tax evasion.

To empirically test this relationship, Dulleck et al. (2016) used heart rate variability to measure aversive emotional reactions and their intensity in tax compliance decisions. In this context, heart rate variability can be seen as a correlate of emotional reactions that may arise from imagining legal or social norm violations. The authors observed a positive correlation between heart rate variability and tax compliance, suggesting that more intense aversive emotional reactions are associated with higher tax compliance. Further support for the link between aversive emotions and compliance decisions was provided by Grasmick and Bursik (1990) in a survey study. Bosco and Mittone (1997) and Blaufus et al. (2017) conducted controlled experiments and confirmed that shame is an effective deterrent of tax evasion, at least in the short run.[h] In a series of experiments, Austin et al. (2021) showed that emotions stemming from being in a tax-due position lead to greater moral disengagement, which is directly related to noncompliant tax behavior. Consistent with prospect theory, these feelings are evoked as a result of being in a gain or loss position.

In summary, although only a few studies have thus far investigated the role of emotions in the tax context, integral emotions appear to be important drivers of tax compliance behavior. In particular, an intended violation of an injunctive or descriptive legal or social norm might result in an aversive emotional reaction while making a tax compliance decision, thus representing moral costs, reducing the expected utility of tax evasion and thus inhibiting norm violations.

2.3. Incidental background emotions and economic decision making

Recent literature provides robust evidence that incidental emotions impact economic decision making.[i] In an important study on the influence of incidental emotions on norm compliance (i.e., the norm to be honest), Vincent et al. (2013) used short video clips to induce positive or neutral emotions while participants solved a number-search task (introduced by Mazar et al., 2008). The participants were instructed to find two numbers in a matrix with 12 three-digit numbers that add to 10 (e.g., 5.12 and 4.88). The worksheet included 20 matrices, and the working time was five minutes. For each correct answer, $0.50 was paid, i.e., a maximum of $10 could be earned in the experiment. After five minutes, the participants were asked to report how many tasks they had solved and to take the respective amount themselves from an envelope filled with 10$. A system identifying numbers written in invisible ink allowed the researchers to calculate the difference between the actual earned amount and the reported amount. Compared to the neutral condition, cheating occurred significantly more often after being primed with positive incidental emotions, suggesting that incidental emotions influence compliance attitudes (in this case, the attitude toward lying).

Incidental emotions also affect risk taking. Johnson and Tversky (1983) presented newspaper articles designed to induce either a positive or negative mood and asked participants to estimate the death rates of various potential causes of death (e.g., heart disease). Participants who read negative newspaper articles provided more pessimistic estimates than participants who read positive newspaper articles. Several studies have investigated incidental emotions and risk taking in economic settings. For example, Au et al. (2003) found that financial market traders differ in their trading behavior depending on whether they are in a good or bad emotional state, which was elicited by music. Traders in a good emotional state exhibited overconfidence and inferior performance compared to traders in a bad state who performed more conservatively. Similarly, Chou et al. (2007) compared risk-taking behavior after priming individuals with positive, aversive, or neutral incidental emotions. Risk taking was most pronounced in the happy priming condition.

Some studies also aimed to relate incidental emotions to the parameters of specific models of decisions under risk. For example, Schulreich et al. (2014) showed that individuals choose the riskier of two lotteries significantly more often after being primed by happy music-evoked incidental emotions than after being primed by sad incidental priming and after listening to random tones. The observed difference can be attributed to changes in probability weighting within the framework of prospect theory.

Empirical studies have also aimed to relate the current emotional state of investors to stock returns and other measures of financial

[h] Enachescu et al. (2019) report that tax issues (e.g., accounting tasks, filing tasks, contact with tax authority) elicit emotions such as anger, fear, self-blame or positive feelings, which might impact compliance. Gangl et al. (2016) use contextual aspects to trigger emotions to study whether it affects tax compliance in a national pride setting.

[i] See George and Dane (2016) for a literature review, but also Enachescu et al. (2021).

risk taking. For example, Hirshleifer and Shumway (2003) built upon the finding that sunny weather is associated with an upbeat mood. These authors found that morning sunshine in the city of a country's leading stock exchange is strongly related to stock returns. Kamstra et al. (2003) investigated the possible relationship between seasonal effects on stock returns and seasonal variations in mood. Thus, these authors built upon seasonal affective disorder (SAD), which is a seasonal effect on mood likely caused by relatively fewer hours of daylight during autumn and winter. Their results strongly support the SAD effect in the seasonal cycle of stock returns. Both of the previously presented findings might be caused by an indirect effect of testosterone increase. In men, testosterone levels have been shown to predict risk taking and daily profitability in traders (Coates and Herbert, 2008). Although the evidence is mixed, some studies suggest a relationship between sunshine and testosterone levels in men (see, e.g., Smith et al., 2013, for review).

Edmans et al. (2021) used music-based sentiment as a measure of the mood of investors and found a positive association with stock returns. Birru (2018) analyzed investment behavior across different days of the week. Speculative stocks tend to have lower returns on Mondays and higher returns on Fridays than nonspeculative stocks. These findings remain robust across time periods and are not influenced by macroeconomic or firm-specific news, institutional trading, or market liquidity changes. Research in psychology also shows a pattern of mood variation throughout the week, with lower moods on Mondays and higher moods on Fridays. The observed return patterns align with the idea that a decreased mood on Mondays may result in lower returns for speculative stocks, while an increased mood on Fridays may lead to higher returns for speculative stocks. Consequently, the author concludes that the "evidence is consistent with an explanation in which speculative stocks experience increases in stock price concurrent with increases in sentiment (Fridays) and decreases in stock price concurrent with decreases in sentiment (Mondays)" (Birru, 2018, p. 183). These findings are consistent with experimental evidence (e.g., Schulreich et al., 2014) suggesting that individuals are more willing to take risks when they are in a happy mood (i.e., on Fridays). Further evidence for an influence of incidental emotions on risky choices comes from neuroscience research. Morawetz et al. (2019) investigated the impact of emotion regulation on the effect of incidental emotions on risk taking. The authors found that emotion regulation was followed by less risky decisions, as reflected by an increase in brain activation in the dorsolateral and ventrolateral prefrontal cortex as well as the cingulate cortex.

Incidental emotions have also been shown to influence economic decisions in social interactions. For example, Capra (2004) induced incidental emotions through memory elicitation (i.e., the participants were asked to recall and write about a sad or happy event) and experiences of success and failure during an experiment (i.e., the participants were confronted with either difficult or easy test questions). Participants in a positive emotional state were more altruistic in dictator games than participants in an aversive emotional state. Kirchsteiger et al. (2006) used funny and sad movies to induce incidental emotions and observed that aversive emotions foster reciprocity, whereas positive emotions foster generosity in a gift-exchange game. Drouvelis and Grosskopf (2016) also used movies and found that angry individuals contribute less to a public good than happy individuals. Moreover, anger seems to lead to harsher punishment than happiness.

In summary, incidental emotions in general play an important role in making economic decisions. Related literature suggests that incidental emotions might influence both compliance attitudes and risk taking, which have been shown to be relevant in tax compliance decisions.

2.4. Incidental background emotions and tax compliance behavior

To our knowledge, only two studies have investigated the influence of incidental emotions on tax compliance behavior (Enachescu et al., 2019, 2021). They had a nearly identical experimental design, and neither found evidence in favor of an influence of incidental emotions on tax compliance behavior. We believe, however, that several design choices might have caused the observed null findings.

Both studies had the following general experimental structure. The studies involved tax games consisting of 16 repeated rounds conducted under different emotional conditions. In each round, participants began with a set income and had the opportunity to earn an additional amount through a real-effort slider task (Gill and Prowse, 2012). After completing the task, participants were asked to make an income tax declaration decision. The tax rate (40 %), audit probability (25 %), and penalty for tax evasion (owe tax plus an equal fine) remained consistent throughout all rounds. Audits were predetermined based on the audit probability and occurred simultaneously for all participants. Feedback regarding audits was provided after each round.

After the first eight rounds, which served as a within-person baseline, emotion induction occurred. Whereas Enachescu et al. (2019) used music to induce emotions, Enachescu et al. (2021) used video clips with background music. Background music continued to play for the remaining eight rounds. Emotion induction failed in Enachescu et al. (2019), providing a simple explanation for why no differences in tax compliance behavior were observed. Enachescu et al. (2021) reported that emotion induction led to significantly different ratings for happiness, anger, and fear.

However, both the studies by Enachescu et al. (2019, 2021) and our study are based on the idea that integral emotions caused by the task and induced incidental background emotions interact. As Västfjäll et al. (2016) concluded in their review on the integration of integral and incidental affect, the effect of integral affect likely dominates the effect of incidental emotions when both are present. The experiment conducted by Enachescu et al. (2021) involved several sources of integral emotions that might have reduced the relative influence of induced incidental emotions. (i) The real-effort task that participants performed before each tax compliance decision included a time limit, which might have caused stress and unpleasant feelings. (ii) Participants performed 16 identical tax compliance decisions based on the incomes earned during the real-effort tasks, which might have been irritating. (iii) The task included feedback, which might also induce emotions. These emotions might range from happiness, when participants evaded taxes and were not detected, to anger, when they evaded and were detected.

Furthermore, as Enachescu et al. (2021) wrote, "the source of emotion induction was rather salient in this study, as participants attentively watched the four to five-minute-long video clips. Some authors argue that the carry-over effects of incidental emotions

appear only when participants are unaware of the source of emotion and therefore misattribute it to the decision task (Schwarz & Clore, 1983)".

In summary, thus far, two studies have failed to find evidence for an influence of incidental emotions on tax compliance behavior. However, as absence of evidence is no evidence for absence and several design features might have caused additional integral emotions that reduced the effect of incidental emotions on tax compliance behavior, whether and how incidental background emotions have an impact on tax compliance remains unknown.

3. Theory and hypothesis

Tax compliance decisions are often operationalized as decisions under risk (Allingham and Sandmo, 1972; Srinivasan, 1973). Noncompliance usually bears the risk of being penalized with a certain probability. Addressing the tradeoff between obtaining a certain outcome when being compliant and taking the risk of being noncompliant to obtain potentially higher outcomes depends on the decision maker's willingness to take risks, among other things. In particular, a greater willingness to take risks is associated with lower compliance.

Here, we refer to the risk-as-feelings hypothesis (Loewenstein et al., 2001) and argue that both integral and incidental emotions influence tax compliance behavior (Section 3.1). Other models, such as the emotion-imbued choice model (Lerner et al., 2015), make similar predictions. We generalize the tax compliance model of Erard and Feinstein (1994), which integrates the integral emotions of guilt and shame, to also account for the effect of incidental emotions (Section 3.2). Based on the proposed model, we derive a directed hypothesis on the effect of positive (vs. aversive) incidental emotions on tax compliance (Section 3.3).

3.1. Risk-as-feelings hypothesis

Traditional models of decision making under risk take a consequentialist perspective; i.e., these models assume that individuals assess the severity and probabilities of the possible consequences of the choice alternatives and integrate this information via some type of expectation-based computation that leads to a decision. Following this path of reasoning, emotions do not play a causal role in decision-making processes but are regarded as byproducts of consequentialist evaluation. In contrast, the risk-as-feelings hypothesis proposes that the current emotional state influences decision making (Loewenstein et al., 2001). The current emotional state is supposedly influenced by both integral and incidental factors. For example, the nonconsequential aspects of choice alternatives (e.g., moral aspects) might result in integral emotions and consequently influence the current emotional state. This state may also be shaped by incidental factors, such as the background mood. As mentioned above, Johnson and Tversky (1983) showed that individuals who read newspaper articles that elicit sadness provide higher risk estimates of several potential causes of death than do individuals who read articles eliciting happiness. Thus, the risk-as-feelings hypothesis proposes that the current emotional state, which is influenced by both integral and incidental factors, affects decisions under risk.

3.2. Generalization of the Erard–Feinstein model

Erard and Feinstein (1994) proposed a theoretical model of the role of "moral sentiments" (i.e., emotions) on tax compliance decisions. According to their model, two aversive integral emotions, i.e., shame and guilt, play a central role in tax compliance. Dulleck et al. (2016) built upon the idea proposed by Erard and Feinstein (1994) and slightly modified their model by using only one parameter g for the tax compliance attitude, which determines the strength of the aversive integral emotions that occur while contemplating tax evasion. The resulting model builds upon the common approach in the tax compliance literature to use expected utility theory (*EUT*) but assumes risk-neutral individuals.

$$EUT(D) = \left(\frac{1}{1+g\cdot\left(\frac{t\cdot(Y-D)}{Y}\right)}\right)\cdot\begin{pmatrix} p\cdot(Y-t\cdot D-f\cdot t\cdot(Y-D)) \\ +(1-p)\cdot(Y-t\cdot D)\end{pmatrix} \quad (1)$$

According to this model, individuals are assumed to choose an optimal amount D of income to report by considering the probability p that they will be audited and have to pay a penalty (if they underreport). Here, a proportional tax t is assumed. If an individual is audited, the true income Y will be detected, and the difference between the true and declared income will be taxed with a fine multiplier $f \bullet t \bullet (Y\text{-}D)$ (i.e., repayment of undeclared taxes plus a penalty). The equation adjusts the expected utility by introducing parameter g, which represents the tax compliance attitude and the strength of the aversive integral emotion resulting from a possible norm violation. For example, compared to taxpayers with a low tax morale, taxpayers with a high tax morale (i.e., high tax compliance attitude) will show a higher level of aversive integral emotions when contemplating tax evasion. Within the model, this effect is operationalized by the term within the first brackets. The denominator $1+g\cdot\left(\frac{t\cdot(Y-D)}{Y}\right)$ is larger than one when individuals underreport. It is assumed that they feel guilty, thereby reducing their overall utility level from tax evasion. This effect becomes stronger with a higher level of tax compliance attitude (g).

We generalize the tax compliance attitude parameter g introduced by Dulleck et al. (2016). Here, we do not consider the tax compliance attitude to be a constant trait, but this attitude also depends on situational and contextual influences. The experimental literature on the relationship between tax morale and patriotism nicely illustrates that patriotism can be primed by pictures or videos

(e.g., Gangl et al., 2016 and Macintyre et al., 2023) and thereby influences tax compliance. We build on this view and propose that tax compliance attitude also depend on the current emotional state *E* (e.g., Vincent et al., 2013). The newly introduced function *g(M,E)* depends on both the tax morale *M*, which is supposedly a constant trait, and the current emotional state *E*, which can vary depending on the situation and context.[j] According to Dulleck et al. (2016), higher values of the constant parameter *g* are associated with higher levels of aversive emotions. Consistent with this view, the tax compliance attitude function *g(M,E)* we propose has a higher value with a worse (i.e., more aversive) current emotional state and a lower value with a better (i.e., more positive) current emotional state. An increase in *g* reduces the expected utility from tax evasion and consequently decreases the level of tax evasion (and vice versa). Notably, we use the specific functional form proposed by Erard and Feinstein (1994) and Dulleck et al. (2016) as an example. Other functional forms implying that a higher value of the tax compliance attitude function *g* leads to a lower subjective value (expected utility) for tax evasion might also serve as a description of the effects hypothesized below.

Several studies support the theoretical arguments of the risk-as-feelings hypothesis that incidental emotions also influence the willingness to take risks. Schulreich et al. (2014) fitted the parameters of prospect theory (Kahneman and Tversky, 1979; Tversky and Kahneman, 1992) and attributed the effect of incidental emotions on risk taking to an influence on probability weighting. For probabilities higher than 0 % and lower than 100 %, individuals assigned higher decision weights after positive priming compared to aversive priming. Therefore, we further generalize the expected utility formulation introduced by Dulleck et al. (2016). Here, we apply a formulation used to describe the subjective value (SV) in prospect theory, allowing for both probability weighting *w* and a nonlinear value function *v* (Kahneman and Tversky, 1979; Tversky and Kahneman, 1992). In line with the results of Schulreich et al. (2014), we propose that the probability weighting function *w(p,E)* depends on not only the probability *p* of different possible outcomes but also on the current emotional state *E*. We assume that the decision weights will be higher with a better (i.e., more positive) current emotional state. An increase in decision weights increases the subjective value (expected utility) from tax evasion and consequently increases (decreases) the level of tax evasion.

$$SV(D) = \left(\frac{1}{1 + g(M,E) \cdot \left(\frac{t \cdot (Y-D)}{Y} \right)} \right) \cdot \begin{pmatrix} w(p,E) \cdot v(Y - t \cdot D - f \cdot t \cdot (Y-D)) \\ + w((1-p),E) \cdot v(Y - t \cdot D) \end{pmatrix} \tag{2}$$

3.3. Hypothesis

Our generalized model of tax compliance is consistent with recent conceptualizations in psychology that suggest that incidental emotions might interact with integral emotions (Västfjäll et al., 2016). In particular, the effect of an aversive integral emotion resulting from an intended norm violation might be reduced by a positive incidental emotion and amplified by an aversive incidental emotion. This effect is in line with the so-called additivity-of-affect hypothesis, which suggests that congruent valences of incidental and integral emotions are added and that incongruent valences cancel each other (Neumann et al., 2001; Västfjäll et al., 2016). This effect is also in line with the dual-emotion concept, which suggests that the effect of an integral emotion can be reduced by inducing a counteracting incidental emotion (Lerner et al., 2015). As aversive integral emotion might increase the tendency to be compliant, a positive incidental emotion might reduce this positive effect on compliance behavior. In contrast, an aversive incidental emotion will amplify (or at least retain) this positive effect.

This process is reflected in the tax compliance attitude function *g(M,E)* and the probability weighting function *w(p,E)*. Positive incidental emotions lead to a better current emotional state and, consequently, to a lower tax compliance attitude and higher decision weights. In contrast, aversive incidental emotions lead to a worse current emotional state, resulting in a higher tax compliance attitude and lower decision weights. Thus, we expect positive incidental emotions to lead to a lower willingness to be tax compliant, whereas aversive emotions are expected to lead to a higher willingness to comply.

Hypothesis: *Positive incidental emotions lead to lower tax compliance behavior than aversive incidental emotions.*

This hypothesis is tested by means of the following two studies. In Study 1, we aim to gain initial insights by applying a correlational approach to investigate the effect of incidental emotions on tax compliance attitude, an important determinant of tax compliance behavior (e.g., Alm, 2019; Cummings et al., 2009; Kirchler, 2007; Lewis, 1982; Torgler, 2002), using the results of an online survey. In Study 2, we investigate the causality of incidental emotions and tax compliance behavior in a controlled laboratory experiment.

4. Study 1: large-scale survey with taxpayers

4.1. Sample and data

In Study 1, we use data obtained from an online survey conducted by the Ministry of Finance of North Rhine-Westphalia (Germany).[k] North Rhine-Westphalia is the most populous federal state in Germany, with 8.48 million taxpayers with income tax liability

[j] For the sake of simplicity, we do not explicitly mention other situational and contextual influences on g. However, the function could be easily generalized.

[k] This setup restricts data availability for us (e.g., no data on work schedule, job satisfaction). Blaufus et al. (2019) use the same survey data and provide new insight into the tax compliance cost structure in Germany.

(>20 % of the German taxpayer population). The online survey was conducted from April 4, 2016, to December 31, 2016. All taxpayers who received a tax assessment notice in 2016 also received an individual invitation letter to the online survey from the Minister of Finance of North Rhine-Westphalia.

The survey was designed to collect information regarding several tax-related variables, tax enforcement, general satisfaction with the local tax office, and tax knowledge. Importantly, an additional question addressed tax compliance attitudes. Furthermore, socio-odemographic variables, such as gender, age, yearly gross income, education, and tax support, were assessed, and information regarding local tax offices was acquired. In total, our sample consists of 22,220 German taxpayers who completed the survey. As the purpose of the survey was not to investigate the influence of incidental emotions on tax compliance, it does not contain information related to the current emotional state or other emotion-related variables. Thus, the emotional state can only be captured indirectly by proxies. The following section discusses different methods for gathering information on the current emotional state.

4.2. Proxies for incidental emotions

For >40 years, research in the field of affective psychology has addressed the question of how the current emotional state varies across the *days of the week*. Since the large-scale study by Rossi and Rossi (1977), several studies have supported the notion of a weekly mood cycle (e.g., Csikszentmihalyi and Hunter, 2003). The following three main effects were identified: (i) the "Blue Monday" effect, indicating that the current emotional status is the worst on Mondays (e.g., Areni and Burger, 2008); (ii) the "Thank God it's Friday" (TGIF) effect, indicating that the current emotional status is higher on Fridays than on other workdays (e.g., Egloff et al., 1995; Larsen and Kasimatis, 1990; Reis et al., 2000); and (iii) the weekend effect, indicating that individuals' current emotional state is the most positive on the weekend (e.g., Egloff et al., 1995; Reis et al., 2000). While most studies used student samples with quite low sample sizes, a recent study attempted to replicate the above-described effects using data from a survey of 340,000 Americans (Stone et al., 2012). Their results supported the weekend and "Thank God it's Friday" effects but failed to find significant evidence of the "Blue Monday" effect, although positive affect is the lowest and negative affect is the highest on Mondays. Interestingly, the weekend effect was significantly lower among retired and older individuals, suggesting that this effect is driven by the link between the leisure and/or pleasant nature of weekend activities and positive emotions. Furthermore, Golder and Macy (2011) analyzed mood variation using a sample of 2.4 million individuals who posted over 500 million tweets from February 2008 to January 2010. Their findings reaffirm that mood tends to be better on Fridays than on Mondays through Thursdays. Birru (2018) introduced these findings to the economics literature. He used days of the week as a proxy for emotional state variation and showed that individuals tend to invest more riskily on Fridays than on Mondays. We explicitly follow this established approach and use Monday as a proxy for a negative emotional state and Friday and the weekend as proxies for positive emotional states.

Several studies in affective psychology have also investigated the relation between weather variables and mood. Individuals typically feel happier on sunny days than on rainy days (Schwartz and Clore, 1983). In line with these results, anxiety was shown to be negatively related to hours of sunshine but positively related to precipitation (Howard and Hoffman, 1984). Additionally, life satisfaction was shown to decrease with the amount of rain on the day of the assessment (Connolly, 2013). Based on these and other findings, Hirshleifer and Shumway (2003) show that morning sunshine in the city of a country's leading stock exchange is strongly related to stock returns, likely because good weather increases the willingness to take risks. We follow this established approach in the economics literature to use weather-related variables as proxies for the current emotional state and investigate differences between rainy days and days without rain in a robustness check.

In summary, previous studies used proxies (e.g., day of the week or weather) to measure variation in emotions (e.g., Hirshleifer and Shumway; 2003; Birru, 2018). Specific days of the week are good proxies for variability in the current emotional state. In particular, the emotional state is most positive on weekends when people enjoy leisure time and most aversive on Mondays when people restart work. Additionally, the emotional state is worse on rainy days than on days without rain. In Study 1, we build upon these established findings to analyze how emotional states affect taxpayers' compliance attitude.

4.3. Empirical model

Estimation Strategy. To test our hypothesis, we estimate the following logit model:

$$TaxComplianceAttitude = \beta_0 + \beta_1 EmotionalState + \beta \times Controls + TaxOfficeFE + \varepsilon \quad (3)$$

TaxComplianceAttitude, as our dependent main variable of interest, captures different measures of tax compliance attitude (see dependent variables). Our independent variable *EmotionalState* takes different proxies for the taxpayer's emotional state into account (see independent variables). *Controls* is a vector of various controls with a corresponding vector of coefficients β (see control variables). We use tax-office fixed effects to control for unobserved time-invariant characteristics (such as different average audit probabilities) that vary across different local tax offices (*TaxOfficeFE*). Furthermore, we use robust standard errors clustered at the tax office level. Participants who did not provide data related to all variables are excluded from the analyses (resulting in a total of 22,220 observations). In the following sections, we describe our variables in detail.

Dependent Variables. To analyze the economic effects on tax compliance, we use the following two variables for Tax Compliance: tax compliance attitude (binary) and tax compliance attitude level (ordinal). Both variables are based on the following question from the survey: "I think you should be honest in your tax returns". The answers are provided on a 5-point Likert scale ranging from 1 = "fully disagree" to 5 = "fully agree". Our tax compliance attitude level variable (*TCAL*) includes all answer levels. Regarding tax compliance

attitude, we dichotomize the answers from the survey. Consistent with Alm and Torgler (2006), we consider participants who fully agree with this question (i.e., answer = 5) to have an attitude of compliance (without any exception), whereas all other participants have an attitude of potential noncompliance, i.e., there might be situations in which they could consider noncompliance justifiable. Consequently, the tax compliance attitude variable (*TCAB*) takes a value of "1″ if participants fully agree with the statement and "0″ otherwise. Our logit regression model is based on *TCAB*. In our robustness tests, we use *TCAL* as a dependent variable.

Independent Variables of Interest. We use different proxies for *EmotionalState* that are associated with more or less positive/aversive emotional states to measure how incidental emotions influence tax compliance attitudes. The survey setup enables us to measure the exact date and time of participation by a digital time stamp. The date when the survey was completed determines the weekday used for our analysis.[l] We define dummy variables for the different weekdays and the weekend as proxies for variability in the emotional state across a week. The dummy variable for the weekend takes the value of "1″ if the survey was completed on the weekend (and "0″ otherwise). We use two variations for our weekend dummy variable: in one setting, we define Saturday and Sunday as the weekend (*Weekend1*), whereas in a broader definition, we also include Friday (*Weekend2*). In addition to the weekend variables, we use single working day variables. The dummy variable *Monday* (*Friday*) is set to "1″ if the survey was completed on a Monday (Friday) and "0″ otherwise. To strictly separate different effects from our proxies for the emotional state, we exclude Friday, Saturday, and Sunday when *Monday* takes the value "0″. Therefore, our dummy variable *Monday* compares Monday to the working days of Tuesday, Wednesday, and Thursday. By defining *Friday*, we exclude the working day Monday (if *Friday* is set to "0″, therefore comparing Friday to the working days Tuesday, Wednesday, and Thursday). In line with our research hypothesis, we conjecture that *Weekend* and *Friday* have negative effects on the tax compliance attitude, whereas *Monday* might have a positive effect.

We also use the weather situation when the survey was completed as another proxy for the emotional state. We know the rough geographical location of a taxpayer via the location of the tax office. We are therefore able to match the survey data with weather data. In detail, we analyzed data from 43 meteorological stations in North Rhine-Westphalia and used precipitation as a proxy for bad weather (and consequently for a worse current emotional state). Our variable *Precipitation* takes the value of "1″ if it rained on the day when a participant completed the survey (and "0″ otherwise). However, we present results on this variable only in appendix A1.1, as it is prone to seasonal effects. Consequently, an interpretation would not be unambiguous. However, our results are robust in showing higher tax compliance attitude levels on rainy days.

Control Variables. The tax compliance literature provides evidence that some sociodemographic variables, such as age, education, gender, and income, have an influence on tax compliance attitudes (Grundmann and Lambsdorff, 2017; Kastlunger et al., 2010; Muehlbacher et al., 2011). To control for these effects, we include the following variables in our analyses: yearly gross income in Euros (*Income*), age in years (*Age*), gender (*Sex*), graduation (*Grade*), tax knowledge (*TaxKnowledge*), and whether taxpayers received support when completing their tax return (*TaxSupport*). Moreover, it has been shown that tax compliance attitudes are correlated with services provided by the local tax office (Blaufus et al., 2021; Gangl et al., 2013). Therefore, we control for service quality based on the ratings of taxpayers (*Service*). In particular, taxpayers were asked about their general satisfaction with their tax office ("I am satisfied with my tax office in general"). To measure a taxpayer's preference for tax enforcement (*TaxEnforcement*), each taxpayer was presented with the following statement: "I think that it is good that the tax authorities acquire tax CDs[m] to combat tax evasion." In line with the slippery slope framework (Kirchler et al., 2008), we expect both variables to have a positive influence on the tax compliance attitude. Each variable is measured on a 5-point Likert scale ranging from 1 = "fully disagree" to 5 = "fully agree". We also considered the time required to complete the survey as a control (*Time*). See Table 1 for all descriptive statistics and further details.

4.4. Results: tax compliance attitude

On average, we find that 75.3 % of the participants exhibit a highly favorable attitude towards tax compliance (i.e., full compliance). The mean tax compliance attitude level (*TCAL*) is 4.71 (histogram is presented in appendix A1.2). As the survey was conducted by the Ministry of Finance of North Rhine-Westphalia with a cover letter from the Minister of Finance, we are unsurprised by the relatively high level. Nevertheless, the results are comparable to the degree of tax compliance attitude observed in other studies and other countries (e.g., Alm and Torgler, 2006). For example, in the World Value Survey (Wave 7, 2017–2021), 74.5 % of German respondents state that cheating on taxes, if you have the chance, is never justifiable.

To first explore how tax compliance varies across weekdays, Fig. 1 shows the daily mean of our binary tax compliance attitude variable *TCAB* (solid line). In fact, we observe important differences across weekdays. The week starts with a relatively high level of 77.3 % on Monday. The mean decreases after Wednesday from 76.6 % to 74.6 % on Friday. The lowest level is observed on Sunday (72.3 %). While the mean from Monday to Friday equals 75.9 % (*Weekend1* = 0), the mean on Saturday and Sunday is only 73.6 % (dashed lines, *Weekend1* = 1). This difference is highly significant (*t*-test, $p < 0.001$, two-tailed). The daily mean of the tax compliance attitude level (*TCAL*) is shown in appendix A1.3.

In the following, we analyze the influence of incidental emotions on tax compliance using our estimation equation for the logistic regression (see Table 2). In all models, our dependent variable is the binary tax compliance attitude (*TCAB*). In models 1 and 2, we regress on a weekend dummy. In model 1, we use *Weekend1*. In model 2, we use *Weekend2*, which also includes Friday (as a pleasant

[l] The mean time to complete the survey was approx. 12 minutes with a maximum of approx. 50 minutes (see Table 1). 24 out of our 22,220 respondents (0.1%) started the survey before and completed it after midnight. Our results are robust when we exclude these observations from the analyses.

[m] Tax CDs contain whistleblower information, e.g., bank accounts of potential tax evaders.

Table 1
Descriptive statistics.

Variable	Description	N	Mean/%	SD	Median	Min	Max
TaxCompliance							
TCAL	Tax compliance attitude level	22,220	4.71	0.56	5	1	5
TCAB	Tax compliance attitude (binary)	22,220	75.3 %				
EmotionalState							
Weekend1	Survey was completed on a weekend (Saturday, Sunday)	5469	24.61 %				
Weekend2	Survey was completed on a weekend (Friday, Saturday, Sunday)	8610	38.75 %				
Monday	Survey was completed on a Monday	3482	25.58 %				
Friday	Survey was completed on a Friday	3141	23.67 %				
Controls							
TaxEnforcement	Tax enforcement	22,220	4.39	1.09	5	1	5
Service	General satisfaction with local tax office	22,220	3.58	1.24	4	1	5
Time	Time to complete survey (in min.)	22,220	11.96	19.74	9.31	1.07	49.88
Sex	Gender (1 = male, 0 = female)	22,220	71.62 %				
Income	Yearly gross income (in Euro)	22,220					
	0 – 15,000	875	3.94 %				
	15,001 – 30,000	4824	21.71				
	30,001 – 50,000	7979	35.91 %				
	50,001 – 70,000	4812	21.66 %				
	70,001 – 150,000	3303	14.86 %				
	Above 150,000 EUR	427	1.92 %				
Age	Age (in years)	22,220					
	0 – 25	512	2.30 %				
	26 – 35	2708	12.19 %				
	36 – 45	3638	16.37 %				
	46 – 55	5805	26.13 %				
	56 – 65	5336	24.01 %				
	66 – 75	3088	13.90 %				
	Above 75	1133	5.10 %				
Grade	Graduation	22,220					
	Lower secondary school	1504	6.77 %				
	Higher secondary school	3739	16.83 %				
	Higher school (abitur)	3207	14.43 %				
	Vocational academy/dual education	1124	5.06 %				
	University of applied sciences	5534	24.91 %				
	University	6594	29.68 %				
	Other	518	2.33 %				
TaxKnowledge	Tax knowledge	22,220					
	No knowledge	586	2.64 %				
	Limited knowledge	4209	18.94 %				
	Average knowledge	10,598	47.70 %				
	Good knowledge	5639	25.38 %				
	Expert knowledge	1188	5.35 %				
TaxSupport	Tax support	22,220					
	Tax advisor	3991	17.96 %				
	Income tax assistance association	815	3.67 %				
	No third-party support	17,414	78.37 %				

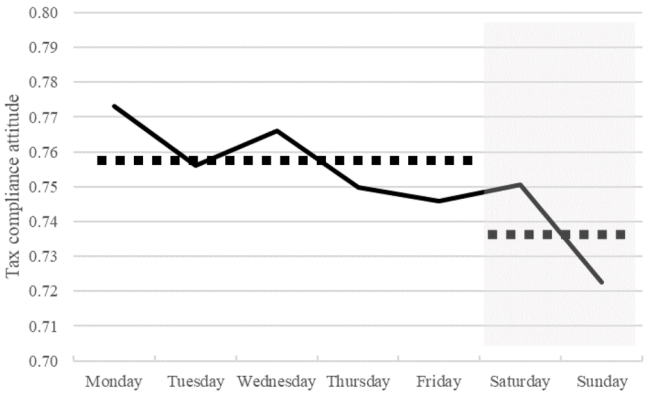

Fig. 1. Mean tax compliance attitude across weekdays.

Table 2
Logistic regressions – study 1 (dependent variable: tax compliance attitude binary (*TCAB*)).

	Weekend		**Blue Monday**	**TGIF**
	Weekend1 Sa/Su vs. M/T/W/Th/Fr	*Weekend2* Fr/Sa/Su vs. M/T/W/Th	Monday vs. T/W/Th	Friday vs. T/W/Th
	Model 1	Model 2	Model 3	Model 4
Weekend	−0.126***	−0.124***		
	(0.0356)	(0.0328)		
Monday			0.111**	
			(0.0440)	
Friday				−0.0716
				(0.0463)
Constant	−0.266*	−0.250*	−0.0818	−0.420**
	(0.152)	(0.151)	(0.200)	(0.195)
Tax office fixed effects	yes	yes	yes	yes
Controls	yes	yes	yes	yes
N of observations	22,220	22,220	13,610	13,269
Pseudo R-squared	0.0407	0.0408	0.0405	0.0430

Note: In this table, the results of the logistic regressions are presented with *TCAB* as the dependent variable (regression coefficients, robust standard errors in parentheses clustered at the tax office level). *** $p \leq 0.01$, ** $p \leq 0.05$, * $p \leq 0.1$.

anticipation of the weekend). In model 3, we study the potential Blue Monday effect using *Monday* (which drops the number of observations to 13,610 since we exclude weekend days). Consequently, the coefficient of the Monday dummy (*Monday*) measures the difference in compliance attitude between Monday and the other workdays. The exclusion of Friday, Saturday, and Sunday ensures that the test of the Blue Monday effect is not distorted by the relatively low compliance attitude levels on these days. Thus, comparing Monday with Tuesday, Wednesday, and Thursday is the ideal test for capturing a pure Blue Monday effect.[n] In model 4, we analyze the potential Thank-God-It's-Friday (TGIF) effect using *Friday*. Consistent with the argumentation for the Blue Monday analysis, we included only observations from Tuesday to Friday (which drops the number of observations to 13,269). In all models, we include the controls described above. The coefficients of the controls are not reported but are shown in Table A1.2 in our online appendix A1.4. Notably, all results qualitatively remain the same when the controls are not included in the regressions. In all models, we include tax office fixed effects (coefficients not reported).[o]

In line with our hypothesis, we observe that the weekend dummy variables *Weekend1* and *Weekend2* have significant negative influences on the tax compliance attitude in both models 1 and 2. Consequently, the tax compliance attitude on the weekend is lower than that on workdays. The coefficient of the weekend dummy is very similar in both models (approx. −0.125), and including Friday (*Weekend2*) does not substantially change the negative influence. In contrast to this effect, but also consistent with our hypothesis, we find that *Monday* has a significant positive influence (model 3). Thus, the compliance attitude on Mondays is higher than that on the other workdays, providing evidence of the Blue Monday effect.[p] *Friday* variable is not significant in model 4, and consequently, we do not find evidence of a TGIF effect.

The effect size of the main effect can be illustrated as follows. The coefficient of *Weekend1* in model 1 corresponds to a marginal effect (on average) of 2.27. Thus, the individual tax compliance attitude (the likelihood of being fully compliant according to the logistic regression) increases by 2.27 percentage points when switching from weekend to workdays. In our sample, 75.3 % of the participants were fully compliant. Given the hypothetical distribution that all participants would have completed the survey on a workday (weekend), we would observe a predicted tax compliance attitude of 76.9 % (74.6 %). Regarding the personal income tax in Germany, the fiscal authorities process approximately 25.619 million tax returns per year from either single individuals or married couples. Assuming that the tax compliance attitude is the same as that in our sample (75.3 %), taxpayers are (not) fully compliant in 19.291 million (6.328 million) cases. Regarding our marginal effect (workdays vs. weekend), the increase in the individual compliance attitude would cause 410,000 additional tax returns to be fully compliant.

4.5. Robustness tests

Ordered logistic regressions. In our analyses, which are presented in Table 2, we used logistic regressions. As the binary tax compliance attitude variable is determined based on a 5-point Likert (ordinal) scale, we reperform all regressions with ordered logistic regression models (with robust standard errors clustered at the tax office level; cutoff points are not reported), but the dependent

[n] Notably, we also performed additional regressions including observations from Friday to Sunday (not reported) and found that the observed Blue Monday effect is even stronger when these weekdays are included.

[o] As a robustness test, we rerun the regressions for a subsample of taxpayers who stated to have no support when completing their tax returns ("no third-party support"). The results are robust to this variation.

[p] In a small-scale field experiment focusing on littering and testing the broken windows theory, Ramos and Torgler (2012) find – in line with our results – that individuals are more norm compliant (in terms of less littering) on a Monday compared to other days of the week.

variable used is the (initial) tax compliance attitude level (*TCAL*) (see Table 3). All results are robust to this variation.

Leisure Variable. Our argumentation for different tax compliance attitudes is based on varying emotional states across weekdays. For example, more leisure time on the weekend likely leads to a more positive emotional state than that experienced on Mondays when a long workweek has only begun. As a robustness check, we test whether and how leisure time influences tax compliance attitudes (Table 4). Although we do not have individual leisure data from our survey participants, we use two dummy variables as proxies. In models 9 and 11, the leisure time dummy (*LeisureTime*) has a value of "1″ if the survey was completed on a public holiday or at a time when schools were closed for school holidays ("0″ otherwise). In models 10 and 12, the dummy is further set to "1″ on weekends. For an average taxpayer, the level of leisure time will be higher during public/school holidays and on weekends. Consistent with our research hypothesis, we conjecture that leisure time leads to a more positive emotional state and consequently to a lower tax compliance attitude.

In models 9 and 10 (11 and 12), we use logistic (ordered) regressions with robust standard errors in parentheses clustered at the tax office level, with *TCAB* (*TCAL*) as the dependent variable (the cutoff points are not reported). In all regressions, we include the controls described above and tax office fixed effects. In all models and consistent with our conjecture, we observe that leisure time has a significant negative effect on tax compliance attitudes.

Selection Bias. We use the Heckman correction approach to provide evidence that selection effects did not bias our analyses (Heckman, 1976, 1979). For example, taxpayers may be more likely to complete the survey on the weekend due to time restrictions on workdays. To address the issue of selective participation, we use survey completion data for the two-stage Heckman correction model: 22,220 participants completed our survey, and 3104 individuals started the survey but did not finish (total: 25,324). We define the dummy variable *SurveyCompletion*, which has a value of 1 if an individual participated in our survey completely and 0 if an individual canceled completion after some time. In the first stage of the Heckman correction, we test the influence of our weekday variables on the probability of survey completion. In the second stage, we then analyze the influence of our weekday variables on tax compliance attitudes with probit regressions, but we correct for self-selection by incorporating a transformation of the predicted individual probabilities.

We use four specifications (see Table 5). In each specification, we consider only one of our weekday variables (*Weekend1, Weekend2, Monday*, or *Friday*) as the independent variable in stage 1. In stage 2, we use the corresponding weekday variable, all controls and tax office fixed effects as the independent variables (robust standard errors clustered at the tax office level). We use the two variants of our weekend variable (*Weekend1, Weekend2*) in specifications 1 and 2, *Monday* in specification 3, and *Friday* in specification 4. Regarding the results obtained during the first stage, we observe that both weekend dummy variables (at the 1 % level) and *Friday* (at the 10 % level) significantly increase the probability of survey completion. However, we do not find a significant effect of *Monday*, which is expected because individuals have more free time on weekends and Fridays but generally do not on Mondays. In the second stage of our specifications 1 to 4, we find support for our previous findings. The tax compliance attitude significantly declines on the weekend (specifications 1 and 2) and increases on Monday (Blue Monday effect, specification 3). Again, we observe no TGIF effect (specification 4). Consequently, our hypothesis is confirmed even after correcting for potential selection bias.

Precipitation. In the previous analyses, we argue that tax compliance attitudes might be influenced by incidental emotions because we find variations between days of the week, which parallel variations in background emotions. However, a selection might have played a role in our survey, as participants selected when to participate. Individuals who think that tax evasion is justified might have tended to participate on the weekend. We therefore follow an established approach in the economics literature to use weather-related variables as proxies for the current emotional state and investigate differences between rainy days and days without rain in a robustness check (Hirshleifer and Shumway, 2003).

We used weather data from the DWD Climate Data Center (CDC). These historical data are quality-controlled measurements and observations derived from Deutsche Wetterdienst (DWD) stations and legally and qualitatively equivalent partner stations operated by climatological and climate-related applications. We identify 43 weather stations in North Rhein-Westphalia that provide daily precipitation data. For each participant in the survey, one weather station is determined by identifying the station closest to her or his local tax office (representing the fiscal revenue district). Fig. 2 displays both the fiscal revenue districts and weather stations in North Rhein-Westphalia.

Based on the exact date of participation and longitudinal data from the closest weather stations, we use precipitation as a proxy for bad weather and, consequently, for a worse current emotional state. In particular, our variable *Precipitation* takes the value of "1″ if it rained on the day when the participant completed the survey ("0″ otherwise). We don't see any overall seasonal effects regarding precipitation. In our sample with 277 observational days we observe 70 days with no rainfall at all and 50 days with rainfall at all weather stations. The days of rainfall are distributed to some extent over the summer period. In line with our hypothesis, we conjecture that the precipitation variable has a positive effect on tax compliance attitude.

To test this association, we use the same approach used in our main regression analysis, as described and presented in Section 4.4. The regression results are shown in Table A1.1. In model 1, we include our variable *Precipitation* (mean 50.93 %), our controls and tax-office fixed effects. In models 2 to 5, we rerun our main regressions presented in Table 2 by additionally including *Precipitation*. In line with our hypothesis and our main findings, we observe a significantly positive coefficient for our variable *Precipitation* in all models. Across models 1 to 3, the effect size of *Precipitation* is almost constant and nearly as high as the effect size of the weekend dummy variable. In model 4 (5), the effect size is somewhat higher (lower). This might primarily result from the drop in the number of observations, as we exclude observations collected on Friday/Monday, Saturday and Sunday in these models. In almost all models, the effect size of *Precipitation* exceeds the effect size of the *Monday* dummy.

Table 3
Robustness tests: ordered logistic regressions (dependent variable: tax compliance attitude level (*TCAL*)).

	Weekend		Blue Monday	TGIF
	Weekend1 Sa/Su vs. M/T/W/Th/Fr	*Weekend2* Fr/Sa/Su vs. M/T/W/Th	Monday vs. T/W/Th	Friday vs. T/W/Th
	Model 5	Model 6	Model 7	Model 8
Weekend	−0.137***	−0.127***		
	(0.0365)	(0.0329)		
Monday			0.0980**	
			(0.0455)	
Friday				−0.0680
				(0.0455)
Tax office fixed effects	yes	yes	yes	yes
Controls	yes	yes	yes	yes
N of observations	22,220	22,220	13,610	13,269
Pseudo R-squared	0.0371	0.0372	0.0366	0.0388

Note: In this table, the results of the ordered logistic regressions are presented with *TCAL* as the dependent variable (regression coefficients, robust standard errors in parentheses clustered at the tax office level). We refrain from reporting the cutoff points and from calculating a constant from the cutoff points. *** $p \leq 0.01$, ** $p \leq 0.05$, * $p \leq 0.1$.

Table 4
Robustness tests: leisure time.

	Logistic regressions (dependent variable: binary tax compliance attitude *TCAB*)		Ordered logistic regressions (dependent variable: tax compliance attitude level *TCAL*)	
	Public and school holidays	Public and school holidays + weekend	Public and school holidays	Public and school holidays + weekend
	Model 9	Model 10	Model 11	Model 12
LeisureTime	−0.381***	−0.327***	−0.376***	−0.328***
	(0.0332)	(0.0291)	(0.0328)	(0.0294)
Constant	−0.225	−0.190	[a]	[a]
	(0.150)	(0.151)		
Tax office fixed effects	yes	yes	yes	yes
Controls	yes	yes	yes	yes
N of observations	22,220	22,220	22,220	22,220
Pseudo R-squared	0.0448	0.0444	0.0405	0.0402

Note: In this table, the results of the (ordered) logistic regressions are presented with *TCAB* (*TCAL*) as the dependent variable (regression coefficients, robust standard errors in parentheses clustered at the tax office level). [a] In the ordered logistic regressions, we refrain from reporting the cutoff points and from calculating a constant from the cutoff points. *** $p \leq 0.01$, ** $p \leq 0.05$, * $p \leq 0.1$.

4.6. Discussion of study 1

Experimental research on tax morale has nicely illustrated that situational and contextual factors might influence tax compliance. Primed patriotism increases tax compliance attitudes (Gangl et al., 2016) and tax compliance behaviors (Macintyre et al., 2023). We proposed that incidental emotions influence tax compliance and hypothesized that positive incidental emotions lead to lower tax compliance behavior than aversive incidental emotions.

In Study 1, we aimed to gain initial insights by applying a correlational approach to investigate the effect of incidental emotions on tax compliance attitude using the results of an online survey. The tax compliance literature provides robust evidence that tax compliance attitude (tax morale) is positively associated with tax compliance behavior (e.g., Alm, 2019; Cummings et al., 2009; Kirchler, 2007; Lewis, 1982; Torgler, 2002).

We follow two established approaches in the economics literature. Specifically, variations in days of the week and weather are used as proxies for incidental background emotions.

Research in the field of affective psychology has robustly observed that the current emotional state varies across weekdays such that it is the most positive on the weekend and most negative on Mondays (e.g., Stone et al., 2012). Furthermore, weather also affects the current emotional state. For example, anxiety has been shown to be positively related to precipitation (Howard and Hoffman, 1984). Furthermore, life satisfaction seems to decrease with the amount of rain on the day of the assessment (Connolly, 2013).

In Study 1, we built upon these findings and analyzed both (i) how daily variation in tax compliance attitude parallels daily variations in the current emotional state and (ii) how tax compliance attitude differs between rainy days and days without rain. Consistent with our prediction, our results suggest that positive incidental emotions (weekend) significantly reduce the tax compliance attitude whereas aversive incidental emotions (Monday, rainy day) increases the attitude towards tax compliance.

Table 5
Control for selection bias – Heckman correction.

	Weekend				Blue Monday		TGIF	
	Weekend1 Sa/Su vs. M/T/W/Th/Fr		*Weekend2* Fr/Sa/Su vs. M/T/W/Th		Monday vs. T/W/Th		Friday vs. T/W/Th	
	Specification 1 Model 13		Specification 2 Model 14		Specification 3 Model 15		Specification 4 Model 16	
	Stage 1 *Survey Completion*	Stage 2 *TCAB*	Stage 1 *Survey Completion*	Stage 2 *TCAB*	Stage 1 *Survey Completion*	Stage 2 *TCAB*	Stage 1 *Survey Completion*	Stage 2 *TCAB*
Weekend	0.225***	−0.0777***	0.165***	−0.0760***				
	(0.0283)	(0.0208)	(0.0223)	(0.0192)				
Monday					−0.0278	0.0634**		
					(0.0298)	(0.0254)		
Friday							0.0511*	−0.0434
							(0.0266)	(0.0273)
Constant	1.114***	−0.349***	1.104***	−0.339***	1.111***	−0.268***	1.111***	−0.429***
	(0.0138)	(0.0776)	(0.0141)	(0.0774)	(0.0152)	(0.104)	(0.0152)	(0.0986)
Tax office fixed effects	no	yes	no	yes	no	yes	no	yes
Controls	no	yes	no	yes	no	yes	no	yes
N of observations	25,324	25,324	25,324	25,324	15,732	15,732	15,266	15,266

Note: This table presents the results of the Heckman correction to control for sample selectivity (regression coefficients, robust standard errors in parentheses clustered at the tax office level). Here, we use survey completion data: 22,220 participants completed our survey, and 3104 individuals started the survey but did not finish (total: 25,324). *** $p \leq 0.01$, ** $p \leq 0.05$, * $p \leq 0.1$.

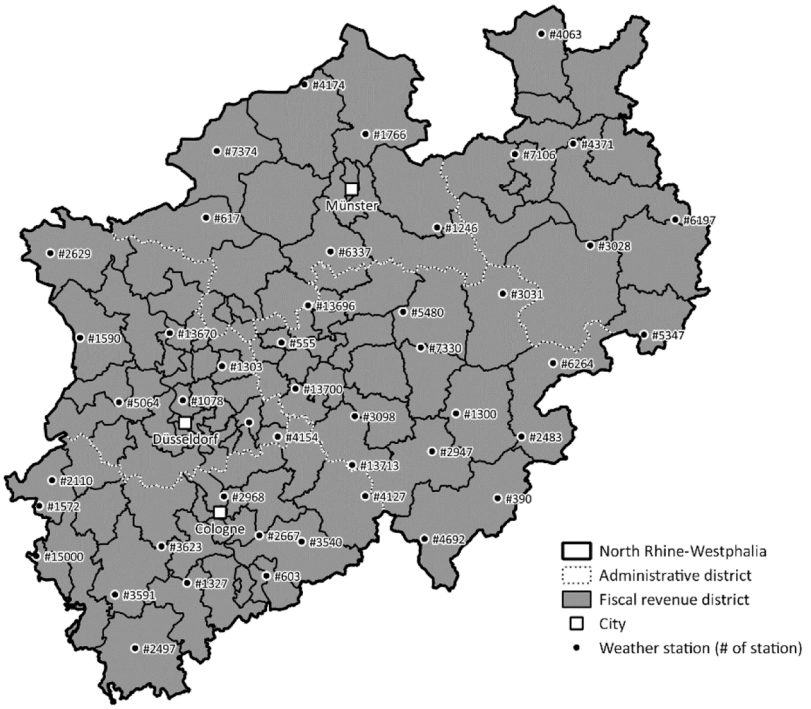

Fig. 2. Map displaying fiscal revenue districts and weather stations in North Rhein-Westphalia.

Although evidence from analyses with two unrelated types of variables (days of the week and precipitation) converges, a selection bias might have played a role in our survey as participants decided when to participate. Individuals who think that tax evasion is justified might have tended to participate on the weekend and on days without any rain. We cannot fully rule out this possibility.

In summary, we provide first insights into the possible influence of incidental emotions and tax compliance behavior. At this point, these findings are, however, somewhat speculative, mainly for two reasons. First, the target variables days of the week and precipitation were not exogenously varied. Second, although there is robust evidence that tax compliance attitude (tax morale) is positively associated with tax compliance behavior there is no evidence that situational influences on tax compliance attitude, such as a possible effect of incidental emotions, also affect tax compliance behavior. Study 2 aims to overcome these shortcomings by means of

laboratory experiments.

5. Study 2: tax compliance experiment

To investigate whether incidental emotions influence not only tax compliance attitudes but also tax compliance behavior and establish causality, we conducted a controlled laboratory experiment with a standard tax compliance setting (Allingham and Sandmo, 1972; Alm, 2019; Torgler, 2002). The tax literature provides a well-established framework for our analysis that uses the observed compliance rates as an indicator of tax compliance behavior. Importantly, the applied tax compliance framework is a nonstrategic task and ensures that strategic uncertainty over others' behavior does not influence one's own behavior.

5.1. Manipulation of incidental emotions

Emotions arise in different situations in real life and can be caused by different types of stimuli. For example, watching a happy face, smelling a pleasant perfume, or listening to nice music can induce happiness. Similarly, the memory of such situations might also elicit such feelings. Experimental research investigating emotions has attempted to mimic these types of situations by relying on texts (e.g., Johnson and Tversky, 1983), videos (e.g., Drouvelis and Grosskopf, 2016), and music (e.g., Schulreich et al., 2014). In the tax compliance context, music (Enachescu et al., 2019) and videos with background music (Enachescu et al., 2021) were used. While the applied music alone did not result in a successful emotion induction, a combination of videos and background music lead to differences in post-experiment ratings of induced emotions. As Enachescu et al. (2021) did not asses changes in the emotional state, it remains unclear whether these differences were caused by the emotion induction.

Pictures represent the most widely used type of affective stimuli (e.g., Lang et al., 2008) and have been used to investigate emotion regulation (Ochsner et al., 2012, for review). The advantage of this modality is that standardized sets of stimulus material exist, increasing the predictability of individuals' affective reactions and offering relatively high control over the experiment. The most commonly used database of affective pictures is the International Affective Picture System (IAPS), which contains ratings of the positive dimensions amusement, awe, content, and excitement and the negative dimensions sadness, anger, disgust and fear. However, a major disadvantage is that IAPS pictures do not provide a standardized rating of valence and arousal, which is a major advantage of a more novel set of standardized pictures, i.e., the Open Affective Standardized Image Set (OASIS; Kurdi et al., 2017). In our study, we used pictures from both databases to induce emotions.

5.2. Pilot study

Before the main experiment presented in study 2 was conducted, we performed an initial experiment, that we present (for the sake brevity) as a pilot study to the main experiment. However, the pilot experiment was fully powered (365 participants). All information and results of the pilot study are provided in online appendix A2. The main result of our pilot study is that positive incidental emotions lead to higher tax compliance than aversive incidental emotions. In particular, income is reported truthfully in 44.2 % of all decisions under the aversive emotion condition compared to 40.8 % under the positive emotion condition. This finding represents the first experimental evidence supporting our research hypothesis.

Although these results appear promising, our pilot study has some limitations. Thus, we slightly changed the setup for the main experiment. First, in addition to the positive and aversive emotion treatments, we use a neutral incidental emotion treatment as a control in the actual experiment. Second, in the pilot study, we used pictures from the IAPS (Lang et al., 2008). Although these pictures have been widely applied in psychological research studying emotions, these pictures are not rated with respect to valence. Furthermore, the participants criticized the "old school" appearance of the pictures, which might have confounded the results, as our intention to present realistic/everyday settings was apparently not successfully implemented. Thus, we use the OASIS database introduced by Kurdi et al. (2017) in our main experiment with more up-to-date images and reliable ratings of the valence dimension. Third, in the pilot study, the participants were informed about the current pretax income on the left-hand side of their computer screen and had to declare this income on the right-hand side on the same page. This procedure confused several participants and therefore might have caused unwanted emotions that interacted with induced emotions. Thus, we decided to display the pretax income on a separate document located on the desk of each participant in the main experiment. Fourth, the order of the pictures was not disentangled from the randomized order of our different decision situations (i.e., income and audit probability variation). In the main experiment, the presentation of the pictures is entirely randomized.

5.3. Experimental design and sample

Experimental Task.

Our experiment consists of nine periods (see online appendix A3 for the translated instructions). In each period, participants receive a (pretax) income ranging from 800 to 1600 experimental currency units (ECU), and their task is to declare the income. As income earned in a real-effort task might cause stress and aversive emotions, we decided to provide participants directly with income. A tax of 25 % is levied on the declared income. After the participants submit their tax return, they are audited with a certain probability. If the participants experienced an audit and evaded, they had to repay the evaded taxes plus additional penalty costs of 100 % of the evaded amount. Consequently, the payoff of each period is calculated as the pretax income minus the declared tax minus the potential repayment and penalty. Importantly, the participants are not informed about the audit outcome after each period, as this might cause

emotional reactions. These emotions might range from happiness, when participants evaded taxes and evasion was not detected over neutral emotions, to anger, when they evaded and were detected. We therefore aimed at minimizing sources of integral emotions that do not relate to tax compliance attitude. Furthermore, experienced audits might influence tax compliance behavior in subsequent rounds through learning effects, that we want to avoid.

We slightly vary the level of pretax income (*PretaxIncome*) and audit probability (*AuditProb*) to change the economic environment in our periods.[q] The order of the presented picture, pretax income and audit probability are randomly determined to control for order effects. While the corresponding audit probability is shown on the choice screen during each period, the pretax income is displayed on a sheet of paper located on the desk of each participant. Before the experiment starts, the participants undergo two training periods to become familiar with the decision situation.

At the end of the experiment, the computer randomly decides which of the nine periods is paid. Then, the participants are informed of the audit outcome and all monetary consequences during the chosen period. The payoff of that period (one ECU = 0.01 €) plus a show-up fee of 4 € is paid in cash at the end of the experiment. On average, the participants earned 13.16 € (SD = 2.51). The mean duration of the experiment was 1 h.

Treatments. We use a between-subjects design with three treatments: positive (*PositiveEmotion*), neutral (*NeutralEmotion*) and aversive emotion (*AversiveEmotion*) treatments. To induce incidental emotions, we use pictures from the Open Affective Standardized Image Set (OASIS) database introduced by Kurdi et al. (2017). This open-access online database consists of a standardized set of 900 color images used to study emotions. All pictures are rated with respect to valence and arousal. The ratings were obtained in a study involving over 800 participants and are highly reliable.

We selected the pictures based on the valence levels reported by Kurdi et al. (2017). We selected the pictures with the highest valence levels for the positive emotion treatment and the lowest valence levels for the aversive emotion treatment. For the neutral emotion treatment, we selected pictures with valence levels exactly between the pictures selected for the positive and aversive emotion treatments. The ratings of the chosen pictures do not differ between genders. All pictures are shown and more information regarding the pictures used are provided in our online appendix A4.

During each period, each participant is presented with one picture. As we have a total of nine periods, we use nine different pictures for each emotion treatment. A picture is displayed only once to a participant. The presentation of a picture starts 10 s before the choice screen is displayed, and the picture remains on the screen until a choice is made, after which a blank screen is shown for 6 s.

Enachescu et al. (2021), who found no influence of incidental emotions on tax compliance behavior, speculated that one reason for their null finding was that emotion induction was quite salient (4–5 min video after 8 rounds of tax compliance decisions). We therefore described the decision screen as follows: "At the top of the screen, you will see an image in each period. The picture has no relation to your decisions. Just imagine watching TV or reading a magazine while making the decision." Furthermore, we did not include a within-subject manipulation (e.g., tax compliance decision before and after emotion induction).

Questionnaires. Before the actual experiment starts, the participants are asked to complete a questionnaire that collects socio-demographic data and information regarding the individuals' risk attitude. In particular, the following variables are collected: *Age* in years, *RiskAttitude* (obtained from the GSOEP survey and provides the subjects' self-reported general willingness to take a risk measured on an 11-point scale, where 0 = "not willing to take risk" and 10 = "highly willing to take risk"), *Female* ("female" = 1, 0 otherwise), and *EconMajor* (1 if the participant studies "economics or management", and 0 otherwise). As we expect that the influence of incidental priming might depend on the subjects' emotional sensitivity, we include an additional questionnaire before the actual experiment starts. We use the 10-item emotional sensitivity scale (*EmoSensScale*) proposed by Nock et al. (2008) (e.g., "I tend to get emotional very easily"). Similar to the original scale, a factor analysis of the translated version (in German) of the scale revealed only one factor and similar reliability (Cronbach's alpha = 0.89).

Furthermore, we use the Positive and Negative Affect Schedule (PANAS) with two 10-item scales to measure the current positive and negative affect before and after the experiment (Watson et al., 1988). Each item is measured on a 5-point scale, and the participants are asked to indicate how much they feel in each presented emotion at the moment (1 = "not at all" and 5 = "extreme"). At the end of the experiment, the PANAS is presented again to control for how the aversive and positive pictures influenced affect.

After the experiment, the participants are asked to rate each picture shown with respect to valence and arousal on a 9-point scale. To assess valence, we applied the following question: "How do you perceive the presented picture?" (9-point Likert scale from 1 = "negative" to 9 = "positive"). To assess arousal, we used the following question: "How exciting do you find the presented picture?" (9-point Likert scale from 1 = "a little exciting" to 9 = "extremely exciting").

Moreover, we collect the following individual data at the end of the experiment: *TaxExperience* ("1″ if a participant ever previously completed a tax declaration, "0″ otherwise), *TaxMorale* (using the following adapted question from the World Values Survey: "How do you evaluate the following statement: Cheating on taxes if you have the chance…?", with the answers provided on a 10-point Likert scale ranging from "…is always justifiable" = 0 to "…is never justifiable" = 9), *DecisionComplexity* (measures how complex a participant perceived the tax-related decisions in the experiment on an 11-point scale ranging from 0 = "low perceived decision complexity" to 10 = "high perceived decision complexity"), *Income* (monthly income in Euros after fixed costs, such as rent), *Shame* and *Guilt* (each variable measures the level of shame/guilt felt by an individual during the experiment on an 11-point scale ranging from 0 = "felt no shame/guilt during the experiment" to 10 = "felt high shame/guilt during the experiment").

Sample. The experiment was conducted at the computerized experimental laboratory of the University of Cologne (CLER) in

[q] The pretax income is 800, 900, 1000, …, or 1600 ECU, and the audit probability is 20%, 30%, or 40%.

December 2018 (no sessions were held on Monday, Friday or the weekend). The experimental software was programmed and operated with z-Tree software (Fischbacher, 2007), and the participants were recruited with ORSEE (Greiner, 2015). In total, 297 participants (56.2 % females, age M 24.1 years and SD 5.17) participated in the experiment. In total, 102 participants were randomly assigned to our positive condition, 96 to our neutral condition, and 99 to our aversive condition. More information regarding our participant pool is provided in our online appendix A5.

5.4. Manipulation checks

Valence Ratings. To determine whether our emotion manipulation was successful, the participants were asked to rate the valence level of each picture presented after all compliance decisions were completed. The mean valence levels of the pictures shown under the positive, neutral, and aversive emotion conditions are 7.42 (SD 1.72), 4.85 (SD 1.97), and 2.04 (SD 1.44), respectively, and the differences among all treatments are significant (*t*-test, all p-values below 0.001, two-tailed).

PANAS. We used the PANAS to determine whether the pictures shown have different effects on the current positive and negative affect. Thus, we asked our participants to complete the PANAS before and after the main experiment (i.e., before and after the participants were presented the pictures).[r] For each type of affect, ten items are used (each measured on a 5-point scale), and the mean rating of all ten items measures the current affect. The higher the level is, the higher the corresponding current affect.

Before the experiment, the mean rating of positive (negative) affect is 2.87 (1.60) in the positive emotion treatment and 2.77 (1.49) in the aversive emotion treatment (see Table 6). The differences between these treatments are not significant (*t*-test, both p-values $>$ 0.10, two-tailed). This indicates that, the participants in the two treatments did not differ in their current positive and negative affect before the experiment started. However, after the experiment, we observe a significantly higher positive affect in the positive emotion treatment than in the aversive emotion treatment (p = 0.012, two-tailed) and a significantly higher negative affect in the aversive emotion treatment than in the positive emotion treatment (p = 0.010, two-tailed). These results provide evidence that our manipulation was successful. Compared to the neutral emotion treatment, we find a significantly higher positive affect in the positive emotion treatment before and after the experiment, but no difference is observed in negative affect. Between the neutral and aversive emotion treatments, we do not observe a significant difference in positive and negative affect before the experiment. After the experiment, we observe a significantly higher negative affect in the aversive emotion treatment.

5.5. Results: tax compliance behavior

Descriptive results. For our tax compliance analysis, we focus on the extensive margin and use the binary variable *CompliantBehavior* as the dependent variable, which is 1 if income is reported truthfully (and 0 otherwise). The main reasons for this focus is that relative declared income is not normally distributed (see histogram in Fig. A5.2 in the Appendix) and therefore cannot be analyzed with parametric methods including control. However, we performed Mann-Whitney-U-Tests to compare average relative declared incomes (mean of relative declared incomes across the 9 decisions of a participant) between conditions. Average relative declared incomes were lowest in the positive treatment (60.03 %) and highest in the aversive treatment (75.50 %). The neutral condition located between the other two conditions (71.91 %). Differences were significant between positive and aversive ($p < 0.001$) as well as between positive and neutral emotions ($p = 0.018$). The difference between neutral and aversive states was not significant ($p = 0.126$) according to the 2-tailed analysis.

Analyses of our binary variable *CompliantBehavior* show similar results. Tax compliance is higher in the aversive emotion treatment group than in the positive emotion treatment group. In particular, income is reported truthfully in 43.1 % of all decisions in the positive emotion treatment group compared to 52.7 % in the aversive emotion treatment group. In our neutral emotion treatment, the share lies between those of the other two treatments, at 47.9 %. The differences between all treatments are significant if we consider all nine decisions of a subject (χ^2 test, $p < 0.05$ in all comparisons, two-tailed).

Regression Results. To corroborate these descriptive results, we use logistic regressions (see Table 7). To consider that the subjects are presented with repeated decision situations, we perform logistic regressions with robust standard errors (models 1 and 2), logistic regressions with robust standard errors clustered at the subject level (models 3 and 4) and logistic panel regressions with random effects, where the subject's identity number is the cross-sectional variable (models 5 and 6). In all the models, the dependent variable is the binary variable *CompliantBehavior*. Moreover, we consider a vector of experiment-specific (the level of audit probability *AuditProb* and pretax income *PretaxIncome*, see Section 5.3) and participant-specific (gender, age, risk attitude, etc.) controls (*Controls*, see Tables A5.1 and A6.1 in appendix A5, A6). Thus, we estimate the following model, in which *RE* in models 5 and 6 refers to the subject-specific random effect:

$$CompliantBehavior = \beta_0 + \beta_1 AversiveEmotion + \beta_2 NeutralEmotion + \beta \times Controls + RE + \varepsilon \quad (4)$$

Our variables of interest are our treatment dummy variables (*AversiveEmotion, NeutralEmotion*). The positive emotion treatment

[r] Notably, both the pictures shown and the experiment can cause a difference in the PANAS values between before and after the experiment. For example, the experiment may be perceived as boring by the participants or the compliance decisions during the experiment may trigger aversive integral emotions (such as guilt or shame), which might lead to a lower PANAS value after the experiment. However, this concern is not manipulated by our treatment variation; therefore these effects are identical in all treatments. The differences among our treatments can be consequently attributed to the different pictures shown during the treatments.

Table 6
Robustness tests: Logistic regressions with precipitation (dependent variable: tax compliance attitude binary (*TCAB*)).

	Weather	Weekend		Blue Monday	TGIF
		Weekend1 Sa/Su vs. M/T/W/Th/Fr	Weekend2 Fr/Sa/Su vs. M/T/W/Th	Monday vs. T/W/Th	Friday vs. T/W/Th
	Model 17	Model 18	Model 19	Model 20	Model 21
Precipitation	0.124***	0.123***	0.123***	0.188***	0.0868**
	(0.0342)	(0.0345)	(0.0343)	(0.0424)	(0.0401)
Weekend		−0.125***	−0.124***		
		(0.0355)	(0.0329)		
Monday				0.0952**	
				(0.0437)	
Friday					−0.0740
					(0.0465)
Constant	−0.347**	−0.331**	−0.316**	−0.176	−0.462**
	(0.152)	(0.153)	(0.152)	(0.201)	(0.193)
Tax office fixed effects	yes	yes	yes	yes	yes
Controls	yes	yes	yes	yes	yes
N of observations	22,220	22,220	22,220	13,610	13,269
Pseudo R-squared	0.0408	0.0413	0.0414	0.0418	0.0433

Note: In this table, the results of the logistic regressions are presented with *TCAB* as the dependent variable (regression coefficients, robust standard errors in parentheses clustered at the tax office level). *** $p \leq 0.01$, ** $p \leq 0.05$, * $p \leq 0.1$.

Table 7
Positive and Negative Affect Schedule (PANAS) test results (study 2).

		PANAS Before experiment			PANAS After experiment			PANAS Difference		
		Positive	Neutral	Aversive	Positive	Neutral	Aversive	Positive	Neutral	Aversive
Positive affect	Mean	2.87	2.67	2.77	2.57	2.37	2.31	−0.30	−0.29	−0.46
	SD	0.71	0.66	0.69	0.74	0.72	0.73	0.54	0.47	0.41
T-tests										
Positive vs. aversive		$p = 0.286$			$p = 0.012$			$p = 0.021$		
Positive vs. neutral		$p = 0.034$			$p = 0.052$			$p = 0.942$		
Neutral vs. aversive		$p = 0.289$			$p = 0.568$			$p = 0.011$		
Negative affect	Mean	1.60	1.62	1.49	1.50	1.56	1.73	−0.10	−0.07	0.24
	SD	0.61	0.65	0.52	0.61	0.66	0.67	0.45	0.48	0.58
T-tests										
Positive vs. aversive		$p = 0.162$			$p = 0.010$			$p < 0.001$		
Positive vs. neutral		$p = 0.831$			$p = 0.534$			$p = 0.575$		
Neutral vs. aversive		$p = 0.122$			$p = 0.065$			$p < 0.001$		

Note: This table shows the results of the PANAS test in study 2 with two 10-item scales used to measure the current positive and negative affect. The higher the level is, the higher the corresponding current affect.

serves as the default. Therefore, each coefficient of our aversive and neutral emotion treatment dummies measures the difference from the positive emotion treatment. We use a Wald test to determine whether both coefficients of the aversive and neutral dummies significantly differ (p-values are reported in the final row of the table). In models 1, 3 and 5, we regress on our treatment dummies only. We additionally include participant-specific variables and experiment-specific variables in models 2, 4 and 6.[s] Notably, the coefficients of the latter variables are not reported but are provided in our online appendix A6.

In all models, the coefficient of the aversive emotion treatment dummy (*AversiveEmotion*) is positive, with significance in models 1 and 2 at the 1 % level and in models 3 to 6 at the 10 % level (Table 8). Along with our descriptive results, we consequently find support for our research hypothesis that compliance with aversive incidental emotions is higher than that with positive incidental emotions. Regarding the neutral condition, we find mixed results. The coefficient of the neutral emotion treatment (*NeutralEmotion*) is positive and significant (at the 5 % level) in models 1 and 2. However, in models 3 to 6, we do not find a significant effect (although still positive). The difference between the aversive and neutral emotion treatments is also only significant in models 1 and 2 (at the 5 % level) but not in models 3 to 6.

With respect to our controls, we observe the following significant correlations in all models (see Table A6.1 in appendix A6), which are in line with the findings of the tax compliance literature. We find a positive effect of the audit probability level (Spicer and Thomas, 1982; Alm et al., 1995; Maciejovsky et al., 2001; Torgler, 2003; Cummings et al., 2009; Fortin et al., 2007; Gërxhani and Schram, 2006)

[s] As two participants did not answered all items on our questionnaires, we remove these two participants (i.e., 2 x 9 = 18 observations) in our models 2, 4 and 6.

Table 8
Logistic regressions with *CompliantBehavior* as the dependent variable (study 2).

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	Robust standard errors		Robust standard errors clustered at the subject level		Panel regressions with random effects	
AversiveEmotion	0.39***	0.41***	0.39*	0.41*	0.94*	1.08*
	(0.09)	(0.11)	(0.21)	(0.24)	(0.50)	(0.56)
NeutralEmotion	0.19**	0.19*	0.19	0.19	0.51	0.54
	(0.10)	(0.11)	(0.22)	(0.24)	(0.50)	(0.57)
Constant	−0.28***	−1.34***	−0.28*	−1.34	−0.61*	−2.67
	(0.07)	(0.44)	(0.15)	(0.86)	(0.35)	(1.98)
Participant-specific controls	no	yes	no	yes	no	yes
Experiment-specific controls	no	yes	no	yes	no	yes
Observations	2673	2655	2673	2655	2673	2655
N of clusters	–	–	297	295	297	295
Pseudo R^2	0.005	0.1646	0.005	0.1646		
Wald test: *Aversive* = *NeutralEmotion*	$p = 0.043$	$p = 0.041$	$p = 0.390$	$p = 0.369$	$p = 0.391$	$p = 0.345$

Note: In this table, the results of the logistic regressions for study 2 are presented, with our binary variable *CompliantBehavior* (which takes the value of 1 if income is reported truthfully and 0 otherwise) as the dependent variable (regression coefficients, standard errors in parentheses). *** $p \leq 0.01$, ** $p \leq 0.05$, * $p \leq 0.1$.

and tax morale level on compliance (Alm, 2019; Kirchler, 2007; Lewis, 1982; Torgler, 2002) and a negative effect of pretax income level in the experiment (Grundmann and Lambsdorff, 2017), risk attitude (Dulleck et al., 2016; Fochmann and Wolf, 2019), economics major, and available monthly income (Gangl and Torgler, 2020).

5.6. Discussion of study 2

Study 1 provided first insights into the possible influence of incidental emotions and tax compliance behavior. These findings were, however, highly speculative because results were correlative and the target variables, days of the week and precipitation, were not exogenously varied. Study 2 aimed to overcome these shortcomings by means of laboratory experiments. Design choice of these experiments were largely influenced by the only studies that have investigated the possible influence of incidental emotions on tax compliance behavior. Both studies included several sources of integral emotions (e.g., real effort task and feedback after each round) that might have reduced the relative influence of induced incidental emotions. We therefore aimed to minimize sources of integral emotions that are not related to tax compliance attitude. We skipped the real-effort task and instead provided income information directly. Furthermore, we omit the feedback, not only to reduce the effect of unwanted integral emotions, but also to avoid possible learning effects on beliefs about audit probabilities, that we cannot control. Finally, we aimed to minimize the saliency of emotion induction.

In an initial pilot experiment, we compared two conditions, positive and aversive, which we induced with pictures from the IAPS database. Although results provided initial evidence for a causal influence of incidental emotions on tax compliance behavior, effect sizes were not very large (truthfully reported income in 44.2 % of all decisions under the aversive emotion condition compared to 40.8 % under the positive emotion condition). This might be due to unwanted emotions caused by specific design features. Some participants reported that they were irritated that income was displayed on the screen (i.e., the computer knows the truth) but that evasion is only detected with a probability below 100 %. Others perceived the IAPS pictures to be "old school". Therefore, in the main experiment of Study 2, we aimed to further reduce unwanted emotional reactions by using a novel set of pictures. Income information was provided on a sheet of paper that was placed on the desk in front of the participants.

However, there are limitations to our experimental approach. First, as in most tax compliance experiments, tax framing is applied, meaning that no real taxes are paid but that a risky gamble is described as a situation in which participants have to pay taxes. Second, tax declarations in real life typically include not only income but also deductions. With our experimental design, we cannot investigate potential differences between the influences of incidental emotions on declared income and declared deductions.

The results of the main experiment of Study 2 provide further evidence that positive incidental emotions lead to lower tax compliance rates than aversive incidental emotions. We observe that compliance after positive incidental priming is lower than that after aversive incidental priming. Specifically, truthful reporting of income is observed in 43.1 % of the decisions in the positive emotion treatment, compared to 52.7 % in the aversive emotion treatment. In the neutral emotion treatment, which served as a control, the percentage was between those of the other two treatments, at 47.9 %. We thus observed larger effect sizes than in our initial pilot study, indicating that changes in experimental design were effective.

The results of our study also support the view that pictures seem to be a useful instrument to prime participants with positive and aversive incidental emotions. In fact, our pictures induced a significantly higher positive current affect in the positive than in the aversive emotion treatment and a significantly higher negative current affect in the aversive emotion treatment than in the positive

emotion treatment (PANAS).

In summary, we found initial evidence for a causal influence of incidental emotions on tax compliance behavior in our fully powered pilot study. The results were replicated and extended in the main experiment of Study 2. Together, the results of the two experiments provide robust and converging evidence that positive incidental emotions lead to lower tax compliance rates than aversive incidental emotions.

6. General discussion and conclusions

Emotions have a strong impact on our everyday lives (Lerner et al., 2015). This paper presents evidence that incidental emotions also shape tax compliance. In particular, in a survey and an experiment, we provide evidence that both tax compliance attitude and tax compliance behavior are lower for individuals with positive incidental emotions than for those with aversive incidental emotions. Both studies complement each other. Whereas our survey enables us to study tax compliance inclination (attitude) for a large taxpayer sample, a causal relationship between incidental emotions and tax compliance behavior is rigorously tested in our experimental study.

In Study 1, we follow two established approaches in the economics literature. Specifically, variations in days of the week and weather as proxies for incidental background emotions (Birru, 2018; Hirshleifer and Shumway, 2003). While the data from the days of the week and precipitation analyses align, it is possible that selection bias influenced our survey results due to participants self-selecting when to participate. Although the findings are thus somewhat speculative, they provide initial evidence for our hypothesis, as there is an established link between tax compliance attitude (tax morale) and tax compliance behavior (e.g., Alm, 2019; Cummings et al., 2009; Kirchler, 2007; Lewis, 1982; Torgler, 2002).

In Study 2, we replicated the results from a pilot experiment, providing evidence for a causal influence of incidental emotions on tax compliance behavior. We found significant differences between induced positive incidental and induced negative incidental emotions in both our pilot experiment and our main experiment. As mentioned above, these results are in line with our survey results in Study 1. Our two studies thus complement each other in that Study 2 establishes a causal effect that relies on the results of Study 1.

Our observed effect is statistically significant and economically meaningful. In our survey, we find a marginal effect of 2.27 for our weekend dummy, indicating that switching from the weekend (when individuals' current emotional state is the most positive) to workdays increases the tax compliance attitude by 2.27 percentage points. In Germany, this increase could cause 410,000 additional tax returns per year to be fully compliant. In our controlled experiment, the tax compliance rate is approximately ten percentage points lower with positive emotions than with aversive emotions. Although we would emphasize that the effect sizes observed in controlled laboratory experiments cannot be directly translated to the field, even a difference of five percentage points would constitute a very large effect (in Germany, almost 1 million tax returns).

Overall, our results have important implications for society, as noncompliance lowers the tax revenue collected and the corresponding provision of public goods.

First, our study contributes to the tax compliance literature. Although evidence suggests that integral emotions occurring while contemplating tax evasion, such as shame and guilt, are important drivers of tax compliance behavior (Grasmick and Bursik, 1990; Bosco and Mittone, 1997; Dulleck et al., 2016; Blaufus et al., 2017), the impact of incidental emotions has rarely been analyzed (Enachescu et al., 2019, 2021). The extant studies did not find evidence for a significant influence of incidental emotions on tax compliance behavior, likely because they included various factors that could have lessened the effect of induced emotions. Real effort tasks and feedback after each round might have resulted in integral emotions unrelated to tax compliance attitudes. By removing unwanted integral emotions, we were able to provide evidence for the influence of incidental background emotions. Nevertheless, further research is needed to study which factors affect the influence of incidental emotions. As the examples of Enachescu et al. (2019, 2021) show, additional sources of integral emotions might substantially lower the effect of incidental emotions. Furthermore, it might be, for example, that habit formation (due to doing the taxes regularly) reduces the effect of incidental emotions on tax compliance. Moreover, completing the tax return on the weekend is likely to cause aversive integral emotions (e.g., due to frustration). Individuals might thus be not as happy as they are on regular weekends, in which they typically have more leisure time. However, this effect might also occur on weekdays, only starting from a lower emotional state, because individuals already worked on these days. Further research might focus on the interplay between incidental background emotions and emotions caused by the work individuals have to do when filing their tax sheets.

Second, our results also contribute to the general compliance literature in which emotions are rarely studied (Vincent et al., 2013). We contribute to the literature by showing that compliance behavior is also influenced by induced emotions that are not related to the actual choice problem. For example, our results suggest that the aversive emotions that individuals feel as a result of a possible social norm violation when behaving in a noncompliant manner might be lower in a positive than in a negative emotional state. Consequently, the positive effect of such aversive emotions on preventing individuals from behaving in a noncompliant manner is also lower, and an increase in noncompliance behavior can be expected.

Third, our findings contribute to the literature studying interaction effects between integral and incidental emotions. Our results are partially in line with the so-called additivity-of-affect hypothesis, which suggests that congruent valences of incidental and integral emotions are added and that incongruent valences cancel each other (Neumann et al., 2001; Västfjäll et al., 2016). Priming with positive incidental emotions might have canceled the effect of aversive reactions to possible social norm violations. This view is also consistent with the dual-emotion concept, which suggests that the effect of an integral emotion can be reduced by inducing a counteracting incidental emotion (Lerner et al., 2015). Furthermore, we contribute to the literature concerning emotions and economic decision making by inducing positive and aversive incidental emotions by means of pictures. To date, different emotional states have been induced by movies (Kirchsteiger et al., 2006; Drouvelis and Grosskopf, 2016; Chou et al., 2007), music (Au et al., 2003; Schulreich

et al., 2014) or imagination/memory tasks (Capra, 2004; Rottenstreich and Hsee, 2001).

There is a growing trend to consider behavioral insights related to techniques and methodologies to improve tax compliance. In 2021, 76 % of tax administrations used behavioral analysis methods to build a more holistic understanding of compliance risks and therefore to enforce tax compliance (OECD, 2023). Our results are in line with the OECD's recommendation to build compliance risk management systems to some extent based on behavioral insights. Tax authorities might adapt their risk management system to assign higher audit probabilities to tax returns submitted online on days associated with more positive incidental emotions (weekends, Fridays, public and school holidays, days with good weather conditions). Given the rapid development of online technology and data science, other opportunities to assess the current emotional state of taxpayers might arise. In recent years, for example, sentiment analyses on Twitter/X have gained popularity. An example tool is the "Valence Aware Dictionary and Sentiment Reasoned! (VADER). VADER is a lexicon and rule-based sentiment analysis tool developed specifically for social media environments. The tool outperforms machine learning techniques in identifying sentiment in tweets (Hutto and Gilbert, 2014) and has been heavily used in research (e.g., Abraham et al., 2018; Kim et al., 2016). Sentiment analyses based on social media data could be performed on the level of tax districts in combination with days of the week and weather to identify days with a high risk of tax evasion.

Moreover, tax authorities might consider the effects of incidental emotions when setting the deadline for submitting tax returns. For example, in Germany, taxpayers usually have to submit their income tax returns by July 31st. However, this timeframe might be more associated with positive incidental emotions (due to school holidays, vacations, or nice weather) than the tax filing deadlines applied in the US (April 15th), Canada (April 30th) or the UK (October 31st for paper and January 31st for online tax returns). During the coronavirus pandemic, deadlines for submitting tax returns were shifted to October and November for income tax returns in Germany. Furthermore, taxpayers could apply to extend the deadline for filing their tax return. In these situations, tax authorities should be aware of whether the shift will lead to an increase or a decrease in tax compliance, thereby facilitating adequate reactions.

Data availability

For study 1, we use confidential data from tax authorities which is not publicly available. Data from study 2 will be made available upon request. Verification of ethics approval for research involving human participants: we follow the German Association for Experimental Economic Research e.V. (GfeW) review procedure for evaluating the ethical aspects of research projects: Institutional Review Board CertificateNo. 8Db174p3, https://gfew.de/ethik/8Db174p3.

Declaration of competing interest

None.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jebo.2024.106854.

References

Abraham, J., Higdon, D., Nelson, J., Ibarra, J., 2018. Cryptocurrency price prediction using Tweet volumes and sentiment analysis. SMU Data Sci. Rev. 1 (3), 1–21.
Allingham, M.G., Sandmo, A., 1972. Income tax evasion: a theoretical analysis. J. Publ. Econ. 1, 323–338.
Alm, J., Martinez-Vazquez, J., and Torgler, B. (Eds.) (2010). *Developing Alternative Frameworks For Explaining Tax Compliance*. Routledge.
Alm, J., 2012. Measuring, explaining, and controlling tax evasion: lessons from theory, experiments, and field studies. Int. Tax Publ. Fin. 19, 54–77.
Alm, J., 2019. What motivates tax compliance? J. Econ. Surv. 33, 353–388.
Alm, J., Sanchez, I., De Juan, A., 1995. Economic and noneconomic factors in tax compliance. KYKLOS 48, 3–18.
Alm, J., Torgler, B., 2006. Culture differences and tax morale in the United States and in Europe. J. Econ. Psychol. 27, 224–246.
Andreoni, J., Erard, B., Feinstein, J., 1998. Tax compliance. J. Econ. Lit. 36, 818–860.
Areni, C.S., Burger, M., 2008. Memories of 'bad' days are more biased than memories of 'good' days: past Saturdays vary, but Mondays are always blue. J. Appl. Soc. Psychol. 38, 1395–1415.
Au, K., Chan, F., Wang, D., Vertinsky, I., 2003. Mood in foreign exchange trading: cognitive processes and performance. Organ. Behav. Hum. Decis. Process. 91, 322–338.
Austin, C.R., Bobek, D.D., Jackson, S., 2021. Does prospect theory explain ethical decision making? *Evidence from tax compliance*. Acc. Org. Soc. 94. https://doi.org/10.1016/j.aos.2021.101251.
Bhattacharjee, S., Moreno, K., 2002. The impact of affective information on the professional judgments of more experienced and less experienced auditors. J. Behav. Dec. Making 15, 361–377.
Birru, J., 2018. Day of the week and the cross-section of returns. J. Financ. Econ. 130, 182–214.
Blaufus, K., Bob, J., Otto, P.E., Wolf, N., 2017. The effect of tax privacy on tax compliance–An experimental investigation. Eur. Acc. Rev. 26, 561–580.
Blaufus, K., Hechtner, F., Jarzembski, J., 2019. The income tax compliance costs of private households: empirical evidence from Germany. Publ. Fin. Rev. 47, 925–966.
Blaufus, K., Hechtner, F., and Jarzembski, J. (2021). Do better tax agency services improve taxpayer compliance? Evidence from Germany, available at SSRN: 10.2139/ssrn.3750859.
Boedker, C., Chua, W.F., 2013. Accounting as an affective technpology: a study of circulation, agency and entrancement. Account. Organ. Soc. 38 (4), 245–267.
Bosco, L., Mittone, L., 1997. Tax evasion and moral constraints: some experimental evidence. Kyklos 50, 297–324.
Capra, M.C., 2004. Mood-driven behavior in strategic interactions. Am. Econ. Rev. 94, 367–372.
Chou, K.L., Lee, T.M.C., Ho, A.H.Y., 2007. Does mood state change risk-taking tendency in older adults? Psychol. Aging 22, 310–318.
Coates, J.M., Herbert, J., 2008. Endogenous steroids and financial risk taking on a London trading floor. Proc. Natl. Acad. Sci. U.S.A. 105 (16), 6167–6172.

Csikszentmihalyi, M., Hunter, J., 2003. Happiness in everyday life: the uses of experience sampling. J. Happ. Stud. 4, 185–199.
Cummings, R.G., Martinez-Vazquez, J., McKee, M., Torgler, B., 2009. Tax morale affects tax compliance: evidence from surveys and an artefactual field experiment. J. Econ. Behav. Organ. 70, 447–457.
Drouvelis, M., Grosskopf, B., 2016. The effects of induced emotions on pro-social behaviour. J. Publ. Econ. 134, 1–8.
Dulleck, U., Fooken, J., Newton, C., Ristl, A., Schaffner, M., Torgler, B., 2016. Tax compliance and psychic costs: behavioral experimental evidence using a physiological marker. J. Publ. Econ. 134, 9–18.
Edmans, A., Fernandez-Perez, A., Garel, A., Indriawan, I., 2021. SSRN Working Paper.
Egloff, B., Tausch, A., Kohlmann, C.-W., Krohne, H.W., 1995. Relationship between time of day, day of the week, and positive mood: exploring the role of the mood measure. Motiv. Emot. 19, 99–110.
Enachescu, J., Olsen, J., Kogler, C., Zeelenberg, M., Breugelmans, S.M., Kirchler, E., 2019. The role of emotions in tax compliance behavior: a mixed-methods approach. J. Econ. Psychol. 74. https://doi.org/10.1016/j.joep.2019.102194.
Enachescu, J., Puklavec, Z., Olsen, J., Kirchler, E., 2021. Tax compliance is not fundamentally influenced by incidental emotions: an experiment. Econ. Govern. 22, 345–362.
Erard, B., Feinstein, J.S., 1994. The role of moral sentiments and audits perceptions in tax compliance. Publ. Fin. 49 (Supplement), 70–89.
Eskenazi, P.I., Hartmann, F.G.H., Rietdijk, W.J.R., 2016. Why controllers comprise on their fiduciary duties: EEG evidence on the role of the human mirror neuron system. Account. Organ. Soc. 50, 41–50.
Fischbacher, U., 2007. z-Tree: zurich toolbox for ready-made economic experiments. Exp. Econ. 10, 171–178.
Fochmann, M., Wolf, N., 2019. Framing and salience effects in tax evasion decisions–An experiment on underreporting and overdeducting. J. Econ. Psychol. 72, 260–277.
Fortin, B., Lacroix, G., Villeval, M.C., 2007. Tax evasion and social interactions. J. Publ. Econ. 91, 2089–2112.
Gangl, K., Muehlbacher, S., de Groot, M., Goslinga, S., Hofmann, E., Kogler, C., Antonides, G., Kirchler, E., 2013. "How can I help you?'' Perceived service orientation of tax authorities and tax compliance. FinanzArchiv 69, 487510.
Gangl, K., Torgler, B., 2020. How to achieve tax compliance by the wealthy: a review of the literature and agenda for policy. Soc. Issues Policy Rev. 14, 108–151.
Gangl, K., Torgler, B., Kirchler, E., 2016. Patriotism's impact on cooperation with the state: an experimental study on tax compliance. Polit. Psychol. 37, 867–881.
George, J.M., Dane, E., 2016. Affect, emotion, and decision making. Organ. Behav. Hum. Decis. Process. 136, 47–55.
Gërxhani, K., Schram, A., 2006. Tax evasion and income source: a comparative experimental study. J. Econ. Psychol. 27, 402–422.
Grasmick, H.G., Bursik Jr, R.J., 1990. Conscience, significant others, and rational choice: extending the deterrence model. Law Soc. Rev. 837–861.
Greiner, B., 2015. Subject pool recruitment procedures: organizing experiments with ORSEE. J. Econ. Sci. Assoc. 1, 114–125.
Grundmann, S., Lambsdorff, J., 2017. How income and tax rates provoke cheating – An experimental investigation of tax morale. J. Econ. Psychol. 63, 27–42.
Guénin-Paracini, H., Malasch, B., Paillé, A.M., 2014. Fear and risk in the audit process. Account. Organ. Soc. 39 (4), 264–288.
Hall, M., 2016. Realising the richness of psychology theory in contingency-based management accounting research. Manage. Acc. Res. 31, 63–74.
Hanlon, M., Yeung, K., Zuo, L., 2022. Behavioral economics of accounting: a review of archival research on individual decision makers. Contemp. Acc. Res. 39, 1150–1214.
Heckman, J.J., 1976. The common structure of statistical models of truncation, sample selection and limited dependent variables and a simple estimator for such models. Ann. Econ. Soc. Measure. 5 (4), 475–492.
Heckman, J.J., 1979. Sample selection bias as a specification error. Econometrica 47 (l), 153–161.
Hirshleifer, D., Shumway, T., 2003. Good day sunshine: stock returns and the weather. J. Fin. 58, 1009–1032.
Hofmann, E., Hoelzl, E., Kirchler, E., 2008. Preconditions of voluntary tax compliance: knowledge and evaluation of taxation, norms, fairness, and motivation to cooperate. Zeitschrift für Psychol./J. Psychol. 216, 209–217.
Hutto, C.J., Gilbert, E., 2014. VADER: a parismonious rule-based model for sentiment analysis of social media text. In: Proceedings of the 8th International Conference on Webblogs and Social Media. Michigan, USA, 1-4 Jun 2014.
Johnson, E.J., Tversky, A., 1983. Affect, generalization, and the perception of risk. J. Pers. Soc. Psychol. 45, 20–31.
Kahneman, D., Tversky, A., 1979. Prospect theory: an analysis of decision under risk. Econometrica 47, 263–291.
Kamstra, M.J., Kramer, L.A., Levi, M.D., 2003. Winter blues: a SAD stock market cycle. Am. Econ. Rev. 93, 324–343.
Kastlunger, B., Dressler, S.G., Kirchler, E., Mittone, L., Voracek, M., 2010. Sex differences in tax compliance: differentiating between demographic sex, gender-role orientation, and prenatal masculinization (2D: 4D). J. Econ. Psychol. 31, 542–552.
Keltner, D.T., Lerner, J.S., Gilbert, D.T., Fiske, S.T., Lindzey, G., 2010. Emotion. The Handbook of Social Psychology. Wiley, New York, pp. 317–352.
Kida, T.E., Moreno, K.K., Smith, J.F., 2001. The influence of affect on managers' capital-budgeting decisions. Contemp. Account. Res. 18 (3), 477–494.
Kim, Y.B., Kim, J.G., Kim, W., Im, J.H., Kim, T.H., Kang, S.J., Kim, C.H., 2016. Predicting fluctuations in crypocurrency transactions based on user comments and replies. PLoS ONE 11 (8), 1–17.
Kirchler, E. (2007). *The Economic Psychology of Tax Behaviour*. New York: Cambridge University Press.
Kirchler, E., Hoelzl, E., Wahl, I., 2008. Enforced versus voluntary tax compliance: the "slippery slope" framework. J. Econ. Psychol. 29, 210–225.
Kirchsteiger, G., Rigotti, L., Rustichini, A., 2006. Your morals might be your moods. J. Econ. Behav. Org. 59, 155–172.
Kurdi, B., Lozano, S., Banaji, M.R., 2017. Introducing the open affective standardized image set (OASIS). Behav. Res. Methods 49, 457–470.
Lang, P.J., Bradley, M.M., and Cuthbert, B.N. (2008). *International affective picture system (IAPS): affective ratings of pictures and instruction manual*. Technical Report A-8. University of Florida, Gainesville, FL.
Larsen, R.J., Kasimatis, M., 1990. Individual differences in entertainment of mood to weekly calendar. J. Pers. Soc. Psychol. 58, 164–171.
Lerner, J.S., Li, Y., Valdesolo, P., Kassam, K.S., 2015. Emotion and decision making. Annu. Rev. Psychol. 66, 33.1–33.25.
Lewis, A., 1982. The Social Psychology of Taxation. Martin Robertson, Oxford.
Loewenstein, G.F., Weber, E.U., Hsee, C.K., Welch, N., 2001. Risk as feelings. Psychol. Bull. 127, 267.
Maciejovsky, B., Kirchler, E., and Schwarzenberger, H. (2001). Mental accounting and the impact of tax penalty and audit frequency on the declaration of income: an experimental analysis. Working Paper.
Mazar, N., Amir, O., Ariely, D., 2008. The dishonesty of honest people: a theory of self-concept maintenance. J. Mark. Res. 45, 633–644.
Muehlbacher, S., Kirchler, E., Schwarzenberger, H., 2011. Voluntary versus enforced tax compliance: empirical evidence for the "slippery slope" framework. Eur. J. Law Econ. 32, 89–97.
Neumann, R., Seibt, B., Strack, F., 2001. The influence of mood on the intensity of emotional responses: disentangling feeling and knowing. Cogn. Emotion 15, 725–747.
Nock, M.K., Wedig, M.M., Holmberg, E.B., Hooley, J.M., 2008. The emotion reactivity scale: development, evaluation, and relation to self-injurious thoughts and behaviors. Behav. Ther. 39, 107–116.
Ochsner, K.N., Silvers, J.A., Buhle, J.T., 2012. Functional imaging studies of emotion regulation: a synthetic review and evolving model of the cognitive control of emotion. Ann. N. Y. Acad. Sci. 1251, E1–E24.
OECD (2021). *Behavioural Insights for Better Tax Administration: a Brief Guide*, OECD, Paris, www.oecd.org/tax/forum-on-tax-administration/publications-and-products/behavioural-insights-for-better-tax-administration-a-brief-guide.pdf.
OECD (2022). *Tax Administration 2022, Comparative Information on OECD and other Advanced and Emerging Economies*, OECD Paris, https://doi.org/10.1787/1e797131-en.
OECD (2023). *Tax Administration 2023, Comparative Information on OECD and other Advanced and Emerging Economies*, OECD Paris, https://doi.org/10.1787/900b6382-en.
Ramos, J., Torgler, B., 2012. Are academics messy? Testing the broken windows theory with a field experiment in the work environment. Rev. Law Econ. 8, 563–577.

Reis, H.T., Sheldon, K.M., Gable, S.L., Roscoe, J., Ryan, R.M., 2000. Daily well-being: the role of autonomy, competence, and relatedness. Pers. Soc. Psychol. Bull. 26, 419–435.
Repenning, N., Löhlein, L., Schäffer, U., 2022. Emotions in accounting: a review to bridge the paradigmatic divide. Eur. Acc. Rev. 31, 241–267.
Rossi, A.S., Rossi, P.E., 1977. Body time and social time: mood patterns by menstrual cycle phase and day of the week. Soc. Sci. Res. 6, 273–308.
Rottenstreich, Y., Hsee, C.K., 2001. Money, kisses, and electric shocks: on the affective psychology of risk. Psychol. Sci. 12, 185–190.
Schulreich, S., Heussen, Y.G., Gerhardt, H., Mohr, P.N.C., Binkofski, F.C., Koelsch, S., Heekeren, H.R., 2014. Music-evoked incidental happiness modulates probability weighting during risky lottery choices. Front. Decis. Neurosci.
Slemrod, J., 2019. Tax compliance and enforcement. J. Econ. Lit. 57, 904–954.
Smith, R.P., Coward, R.M., Kovac, J.R., Lipshultz, L.I., 2013. The evidence for seasonal variations of testosterone in men. Maturitas 74 (3), 208–212.
Spicer, M.W., Thomas, J.E., 1982. Audit probabilities and the tax evasion decision: an experimental approach. J. Econ. Psychol. 2, 241–245.
Srinivasan, T.N., 1973. Tax evasion: a model. J. Publ. Econ. 2, 339–346.
Stone, A.A., Schneider, S., Harter, J.K., 2012. Days-of-week mood patterns in the United States: on the existence of 'Blue Monday', 'Thank God it's Friday' and weekend effects. J. Posit. Psychol. 7, 306–314.
Torgler, B., 2002. Speaking to theorists and searching for facts: tax morale and tax compli-ance in experiments. J. Econ. Surv. 16, 657–683.
Torgler, B. (2003). Tax morale and institutions. SSRN Working Paper.
Traxler, C., 2010. Social norms and conditional cooperative taxpayers. Eur. J. Polit. Econ. 26, 89–103.
Tversky, A., Kahneman, D., 1992. Advances in prospect theory: cumulative representation of uncertainty. J. Risk Uncertain. 5, 297–323.
Västfjäll, D., Slovic, P., Burns, W.J., Erlandsson, A., Koppel, L., Asutay, E., Tinghög, G., 2016. The arithmetic of emotion: integration of incidental and integral affect in judgments and decisions. Front. Psychol. 7, 325.
Vincent, L.C., Emich, K.J., Goncalo, J.A., 2013. Stretching the moral gray zone: positive affect, moral disengagement, and dishonesty. Psychol. Sci. 24, 595–599.
Watson, D., Clark, L.A., Tellegen, A., 1988. Development and validation of brief measures of positive and negative affect: the PANAS scales. J. Pers. Soc. Psychol. 54, 1063.
Wenzel, M. (2002). Tax compliance and the psychology of justice: mapping the field. In V. Braithwaite (ed.). *Taxing Democracy* (pp.41–69). Aldershot: Ashgate.
Wenzel, M., 2004. An analysis of norm process in tax compliance. J. Econ. Psychol. 25, 213–228.
Wenzel, M., 2005. Misperceptions of social norms about tax compliance: from theory to intervention. J. Econ. Psychol. 26, 862–883.