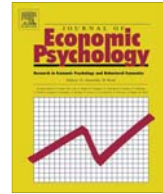


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Work performance and tax compliance in flat and progressive tax systems



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ABSTRACT

Different tax systems, and their impact on work motivation and tax compliance are significant issues in contemporary political and economic debates. The proportional feature of a flat tax system is assumed to lead to higher performance, while the fairness of the redistributive progressive tax system is assumed to result in higher tax compliance. However, empirical findings on the topic are inconclusive. Both work performance and tax compliance under different tax systems were examined in an experiment, with special attention devoted to the effect of a change in tax systems. A flat tax system was supposed to induce greater work performance, whereas a progressive tax system was expected to increase tax compliance based on fairness perceptions, allowing for the opposite effect due to higher complexity. Furthermore, it was assumed that performance and tax payments would be influenced by motives of self-interest. The design included 20 rounds with a real-effort task in each round, determining participants' experimental income. Participants ($N = 191$) made decisions about their tax payments from round-to-round in four different experimental conditions: (1) a flat tax system, (2) a progressive tax system, (3) starting with a flat and changing to a progressive, and (4) starting with a progressive and changing to a flat tax system. Results indicate higher work performance in a progressive system. However, a change from a progressive tax system to a flat system led to increased tax compliance.

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1. Introduction

Most developed democracies have established tax systems in which average as well as marginal tax rates increase with income. Regardless of whether they serve collective goals, e.g., fair income distribution in society, or more specific objectives, such as, for instance, favoring middle-income citizens' desire to reduce their tax liability (Snyder & Kramer, 1988), most countries that are members of the Organisation for Economic Co-operation and Development (OECD) employ a progressive tax system (OECD, 2014). However, tax reforms implemented by the vast majority of Eastern European countries in recent years have led to a change from progressive income tax systems to flat ones (e.g., Peichl, 2014).

In terms of evaluating flat and progressive tax systems, efficiency and fairness considerations play a prominent role. Lay people and experts do not necessarily agree with respect to these considerations, and empirical findings are inconclusive concerning attitudes towards flat and progressive tax systems as well as with regard to work motivation and tax compliance

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under these different systems (e.g., Eriksen & Fallan, 1996; Fochmann & Weimann, 2013; Haferkamp & Fetchenhauer, 2007; Hennighausen & Heinemann, 2015; Oishi, Schimmack, & Diener, 2012; Reimers, 2009; Roberts, Hite, & Bradley, 1994). In the present study we will focus on the impact of flat and progressive tax systems on work performance and tax compliance, in particular when replacing one system with the other. In the following, theoretical considerations and empirical findings concerning these predominant tax systems are reviewed.

1.1. The macroeconomic context of the redistribution of tax revenue

One of the main functions of taxation, besides the provision of public goods and services and financing governmental expenditures, is a fair redistribution of income tax revenue. One potential way to achieve this is the establishment of a progressive tax system, in which average as well as marginal tax rates increase with income (e.g., Samuelson & Nordhaus, 2001). However, introducing a progressive tax system for incomes inevitably increases the complexity of tax laws, and furthermore, might trigger a subjective feeling of higher tax pressure, which is among the most important factors for tax non-compliance and the rise of the shadow economy (Schneider, 2005). Indeed, during the 1970s and 1980s the Swedish government imposed a steep progressive income tax schedule, in which marginal tax rates for some employees were between 80% and 90%, leading to high levels of tax avoidance (Agell & Persson, 2000).

A less complex and a more transparent income tax system, such as a proportional (i.e., flat) system, which imposes a fixed tax rate on all income levels, should lower administrative and compliance costs, and in addition, might increase labor supply and employment, due to lower marginal rates (Peichl, 2014).

Regarding the pros and cons of the different tax systems, the trade-off relationship between fairness and efficiency was a stable concept of the macroeconomic perspective before the 1990s. For instance, Okun (1975) argued that a progressive system of redistribution cannot be efficient for at least two reasons: (1) because of the administrative costs of re-distributional transfers and (2) due to the labor supply response to a progressive system of income taxation. Accordingly, lower net income differences should result in less efficiency, because a progressive tax system is supposed to undermine the incentive to work, especially among those who earn high income (Okun, 1975). Indeed, some empirical findings provide support for this equity/efficiency trade-off, showing that societal income inequality is positively correlated with economic growth, and economic growth increases income inequality (Forbes, 2000; Padovano & Galli, 2001; Scully, 2002).

However, a negative correlation between inequality and growth can also be found in the literature. According to the new endogenous growth theory, a higher level of income equality boosts economic growth in the long run (for a review, see Osberg, 1995). This theory emphasizes the importance of human capital in economic growth. Thus, investing in human capital enhances efficiency: a redistribution favoring the poor opens opportunities for future success by providing access to public goods such as better education or health care, which otherwise would not be accessible to them (Aghion, Caroli, & Garcia-Penalosa, 1999; Osberg, 1995). In this vein, empirical findings suggest that faster economic growth is partly driven by better educated work forces (Sala-i-Martin, 1994) and a higher level of income equality (Galor & Zeira, 1993).

Besides the issue of a potential trade-off between equity and efficiency, fairness considerations are inevitably important because they affect tax compliance as well. Hence, in a system perceived as fair increased cooperation can be expected (Braithwaite & Wenzel, 2008; Kinsey & Grasmick, 1993; Wenzel, 2003). On a purely theoretical basis, a progressive system implies an important characteristic of a fair system, because it is sensitive to the well-being of the poor (Rawls, 1971).

In line with the literature, a plausible conclusion is that a flat tax system should be more efficient, whereas a progressive tax system might be perceived as more just. However, citizens' actual perceptions of efficiency and fairness often deviate from theoretical consideration as well as from large-scale empirical findings. Measuring actual perceptions reveals that these judgments and evaluations are indeed highly context-sensitive. Roberts et al. (1994), for instance, report that people prefer a progressive tax system if questions regarding perceived fairness are phrased in a rather abstract way. If questions are presented in a more concrete way (i.e., questions refer to real life examples) this preference is not observable. Other studies also show reversals of preferences with respect to flat and progressive taxation (McCaffery & Baron, 2004, 2006; Reimers, 2009).

In addition, individual differences also exist in the perception of fairness regarding different tax systems. For instance, there is empirical evidence that people with differing views on fairness (e.g., "rich and poor" vs. "justice in form of equal tax rates") prefer different tax systems (progressive or flat, respectively; Haferkamp & Fetchenhauer, 2007). Furthermore, a negative correlation between (self-reported) social status and preference for progressive taxation has been identified in several studies (Hennighausen & Heinemann, 2015; Pántya, Kovács, & Illyés, 2015).

1.2. Work motivation under different tax systems

The efficiency of tax systems can be judged on the basis of their impact on both work motivation and tax compliance. Regarding work motivation, it has already been mentioned that theoretical reasoning is somewhat inconsistent. However, in spite of these contradictory observations, political discourse often argues for a flat tax system as a successful tool to enhance work motivation and the competitiveness of the economy (see Appel & Orenstein, 2013). The most directly observable manifestation of work motivation is work performance, which is inevitably determined by work effort. However, the effects of effort on performance are moderated by personal variables (such as skills or level of endurance) as well as contextual variables (such as the features of the task to be executed or assigned goals; Bonner & Sprinkle, 2002). In most of the studies investigating the impact of tax systems on work motivation, work performance is in the focus of examination.

According to some views, progressive taxation undermines work motivation, especially among those with higher levels of performance (Okun, 1975). According to the study of Saez, Matsaganis, and Tsakoglou (2012) based on a Greek sample, the increase in marginal tax rates for people with high incomes does not greatly influence motivation to work. The number of laboratory studies investigating the influence of tax systems on work motivation is quite limited. In general, the motivational power of greater income for more work is widely accepted, and also empirically supported (Ariely, Gneezy, Loewenstein, & Mazar, 2009; Lazear, 2000), because it reflects the equity rule, i.e., the existence of a linear positive relationship between performance and income (Adams, 1965; Walster, Walster, & Berscheid, 1978). For instance, in a laboratory experiment applying a real-effort task Sillamaa (1999) showed that performance was higher in a flat tax system, with the implication that such systems are more efficient with respect to labor and to tax revenues. In this vein, Gamage, Hayashi, and Nakamura (2010) also report a positive impact of flat tax systems on work motivation. In their laboratory experiment participants could choose between work and leisure activities, and both willingness to work and work intensity were lower in a progressive tax environment, compared to a flat tax one.

However, there are empirical findings supporting the opposite view of increased work performance under a progressive tax regime, although this evidence is rather indirect. On a societal level this form of taxation – and as a consequence, a decrease in net income inequality – is assumed to facilitate the accomplishments and performance of people experiencing financial constraints (Aghion et al., 1999; Oishi et al., 2012; Osberg, 1995). Nevertheless, a direct positive effect of progressive taxation on work motivation is reported in the literature, as well. Fochmann and Weimann (2013) conducted experiments with German employees as participants, investigating the effects of tax rate, tax salience, and tax experience on work performance as a consequence of work effort. In a progressive tax system participants with lower net household income showed a higher level of work performance in comparison to participants with higher net household income, who worked slightly more in flat tax environments. Thus, a progressive system can have both a direct and a positive impact on work motivation, at least among certain income groups.

1.3. Tax compliance under different tax regimes

The efficiency of a tax system can be judged not only by the resulting work performance, but also by its impact on tax compliance. Since controlling and punishing tax non-compliance in a society is very costly, tax audits usually cannot be carried out extensively. Thus, investigating and understanding the relevant non-coercive determinants of tax compliance is of utmost importance. According to the economic model of the rational decision maker, individual decisions are preceded by an analysis of potential costs and benefits (cf. Allingham & Sandmo, 1972; Becker's approach to criminal activities, 1968). Hence, if someone anticipates being worse off by evading taxes due to a high chance of being caught and punished, compliance can be expected. According to Schneider (2005) higher tax pressure is among the most important factors for tax non-compliance and the rise of the shadow economy. Furthermore, there is plenty of empirical evidence in the literature regarding the positive effects of sanctions on tax compliance (for a review see Braithwaite & Wenzel, 2008). Nevertheless, besides enforcement strategies, tax compliance is often driven by other factors such as anticipated guilt or shame (e.g., Grasmick & Bursik, 1990). Nevertheless, empirical findings also show that sometimes sanctions backfire tax compliance (Kastlunger, Lozza, Kirchler, & Schabmann, 2013; Sheffrin & Triest, 1992).

Importantly, a flat system can increase tax compliance due to its simplicity, as well. When tax regulations are difficult to understand or perceived as ambiguous, compliance can decline (Krause, 2000). Owens and Hamilton (2004) suggest making tax systems simpler and more comprehensive in order to increase cooperation.

According to the notion of a socialized taxpayer, a decision maker in a social environment may not only be driven by self-interest, but also by social factors, such as communal feelings, group identification or honesty. These factors can enhance the importance of taxpayers' perceptions of fairness, and these perceptions are said to have a strong impact on tax compliance (Smith, 1992). In fact, Wenzel (2002) emphasizes that – in line with social identity theory – social norms have a prominent influence on tax compliance, but only if identification with the relevant social category is strong.

In the slippery slope framework of tax compliance economic and social perspectives are integrated (see Kirchler, Hoelzl, & Wahl, 2008; Kirchler, Kogler, & Muehlbacher, 2014), as both the power of authorities and trust in authorities are embraced as important determinants of tax compliance. In the context of this framework, one important factor assumed to influence trust is fairness considerations regarding different tax systems.

In the present study the focus is set on the impact of flat and progressive tax systems – and in particular a change from one system to the other – on work performance on the one hand and tax compliance on the other. In addition to investigating these transitions, another novelty of our experiment not addressed in other experiments is the impact of the respective tax system on performance and compliance conjointly. Thus, our research can contribute to the complex evaluation of the efficiency of different tax systems. The experimental design includes a real-effort task and, moreover, different experimental income groups are considered. Based on the literature discussed, the main assumptions are the following.

It can be assumed that a flat tax system induces greater work performance, especially among participants with a high income. Furthermore, a progressive tax system might increase tax compliance based on fairness perceptions, but it can also decrease tax compliance as a result of its complexity. Regarding tax compliance it is assumed that advantageous changes regarding the tax burden increase compliance. Finally, the hypothesized effects should appear more sharply in the case of a change of tax system, in comparison to constant flat or progressive conditions without change.

2. Method

2.1. Participants

Overall, 192 students (60.2% females; mean age 21.24, $SD = 2.22$) from the University of Debrecen, Hungary, participated in the experiment. One of the participants quit the experiment before completion. The students were recruited from different academic fields (mainly natural sciences (31%), economics and business administration (24%), arts and social sciences (20%), and mathematics and informatics (18%). Students were recruited with the help of a student work agency offering part-time jobs. In Hungary, where the experiment took place, students' earnings are taxable.

2.2. Experimental procedure and design

The experiment was conducted in 16 experimental sessions. Four sessions were run for each of the following experimental conditions: (1) a flat tax system throughout the experiment, (2) a progressive tax system throughout the experiment, (3) starting with a flat tax system and then changing to a progressive tax system, and (4) starting with a progressive tax system and then changing to a flat tax system. In each session 12 participants took part, hence data from 48 participants were collected for each experimental condition. All sessions consisted of 20 taxpaying periods. In the case of a change in the tax system during the session, the new system was introduced after period 10. The experiment was conducted in a completely computerized way, using the z-Tree software (Fischbacher, 2007). Experimental sessions lasted approximately 1 h.

At the beginning, participants were informed that they can earn money – i.e., Experimental Currency Units (ECU) – at the beginning of each period, by working on a task not requiring any experience. The amount in ECU earned by a participant was exchanged for Hungarian Forints at the end of the experiment. The conversion rate of ECU to HUF was set to 1:1.2. On average, participants earned a gross amount of 1446 Hungarian Forints (HUF).¹

For the experimental task we chose the “slider-task” developed by Gill and Prowse (2012) which allows the observation of individual differences on work performance as a closely related consequence of work effort and motivation, in a short period of time. The slider task is easy to explain, can be presented repeatedly and guessing or luck are irrelevant in this real-effort task. In this task a number of sliders are presented on a single screen. By using the computer mouse, these sliders can be moved from their initial positions along a scale ranging from 0 to 100. The participants' task is to move the sliders from their initial position (0) to the middle point (50), one after the other, until the end of the allocated time. Only the initial (0) and the end position (100) of the scales are indicated graphically on the screen. Feedback about success of the proper adjustment of a slider (i.e., finding its target position of 50) is given only after the shifting of a slider has been completed (i.e., a participant stopped moving that given slider). If this feedback differs from 50, the slider can be readjusted an unlimited number of times in order to move it to the middle point of the respective scale. Thus, this task enables participants to collect points by adjusting as many sliders as possible within a certain time limit. Participants' point score in the task is the number of sliders correctly positioned to the middle point.² Since in this task performance may partly depend on motoric skills, change in task performance between the two experimental stages will be used as an index of work performance.

At the beginning of each of the 20 experimental rounds, participants worked on the slider-task and collected scores for correctly adjusted sliders. These scores were converted into the experimental income, indicated in ECU. In each round participants were ranked based on their performance. The four best performers were awarded 100 ECU (the high income group), the following four participants received 80 ECU (the medium income group), and the four weakest performers obtained 60 ECU (the low income group) in the respective round. This procedure was openly communicated and ensured an equal number of participants in each of the three income groups. We also informed participants that any unequal group assignments due to tied scores would be avoided by using a random number generator algorithm when necessary.

Regarding tax rates, we designed comparable tax systems for each condition that yielded the same amount of tax revenue overall. In the flat tax system a tax rate of 25% was introduced for all three income levels. In the progressive tax system participants in the low income group had to pay 20% taxes; in the medium income group the tax rate was 20% for the first 60 ECU and 35% for the additional 20 ECU; in the high income group the first 60 ECU were taxed at 20%, the next 20 ECU were taxed at 35% and the remaining 20 ECU were taxed at 50%. Tax rates were set between 20% and 50%, given findings that tax rates around 30% are usually perceived as fair (Porschke & Witte, 2002), and people tend to accept tax rates of 50% as a maximum (Schmölders, 1975). Table 1 gives an overview of the tax rates and tax dues applied in the flat and progressive tax systems for the three respective income groups.

In each round participants were informed about their performance in the real-effort task (scores), their corresponding earnings in ECU, and the tax due. At the end of each round they were asked to pay tax for the respective round (in practice, their payment could be equal to or less than the amount of tax due). To avoid an unwanted end-effect, participants explicitly asking about the number of rounds were informed that the exact number would be between 10 and 30 rounds. In the conditions introducing a different tax system after period 10, the information about the change was given only when the new system was established.

¹ At the time of the experiment this sum equaled approx. €5, which was somewhat more than what a student in Hungary can earn per hour doing a typical student work activity. Students' earnings are taxable under a flat tax system that has been applied since 2011 to all personal incomes, including low earners.

² The only modification compared to the original version of the task was a reduction in working time from 120 s to 60 s.

Table 1

Tax dues in the flat and the progressive tax system by income groups (tax dues in parentheses).

Tax system	Income groups			Σ Tax revenue
	Low (60 ECU)	Medium (80 ECU)	High (100 ECU)	
Flat	15 (60 × 0.25)	20 (80 × 0.25)	25 (100 × 0.25)	60
Progressive	12 (60 × 0.20)	12 + 7 = 19 (60 × 0.20 + 20 × 0.35)	12 + 7 + 10 = 29 (60 × 0.20 + 20 × 0.35 + 20 × 0.50)	60

All participants were informed that the taxes collected would serve the provision of a common good. The overall tax payments were multiplied by 1.5, and then the pot was equally redistributed among participants, independent of their contributions. In addition, it was communicated that the probability of an audit was 1/6. If anybody were caught evading taxes, besides paying back the tax due, an additional fine equal to the amount evaded had to be paid. In order to prevent unwanted effects associated with feedback on audits and fines on both work performance and tax compliance, information about the occurrence of audits and fines as well as the redistribution of tax money was provided only after the last period in a detailed recapitulation of all 20 rounds.

2.3. Post-experimental measurement

At the end of the experiment participants responded to questions concerning their preferences with respect to different tax systems as well as their clear understanding of rules applied in the experiment. Fairness judgments were assessed by five items (7-point response scales; e.g., “The only fair way is to collect more tax from rich people.” or “Tax dues should be decreased from the high income group to the low one.”). The wordings of these items were derived from [Haferkamp and Fetchenhauer \(2007\)](#). Reliability of the five items was $\alpha = 0.82$. The clearness of rules was addressed by three items (7-point response scales; e.g., “The tax system was clear”; $\alpha = 0.84$). Participants who experienced tax system change during the experiment were asked to form an opinion only about the latter part (i.e., stage 2). [Appendix A](#) contains the list of items.

[Table 2](#) provides an overview of the variables used in the study, displaying possible values for specific variables and a short description for every factor.

3. Results

In this section, effects of a tax system change on our two dependent variables, i.e., work performance and tax compliance are analyzed. Correlation between average performance and average tax compliance throughout all the 20 rounds of the experiment appeared to be significant, but this correlation is negative and rather weak ($r = -0.18$, $p < 0.05$). Based on this small correlation as well as on the conceptually unrelated nature of the two variables, two ANCOVA analyses were performed. The results of the post-experimental questionnaire are also presented.

Table 2

Summary and descriptions of the treatments and variables used in the study.

Variables	Treatments and measurements	Description
Tax system in stage 1 and stage 2	– Flat-flat – Progressive-progressive – Flat-progressive – Progressive-flat	The main treatment variable of the experiment
Income group	– Low – Medium – High	Income group categorization is based on mean performance in stage 1, from period 6th to 10th
Progressive preference	Measured by a five-item scale	Items measuring positive attitude to a progressive tax system, in general
Simplicity	Measured by a three-item scale	Items measuring how simple the participant judged the complexity of the system in the experiment
Work performance	The number of sliders adjusted correctly	In the statistical analyses we used the index of difference between the second-stage mean performance and first-stage mean performance (from period 6th to 10th)
Tax compliance	The ratio of paid tax and the tax due	In the statistical analyses we used the index of difference between the second-stage mean compliance and first-stage mean compliance

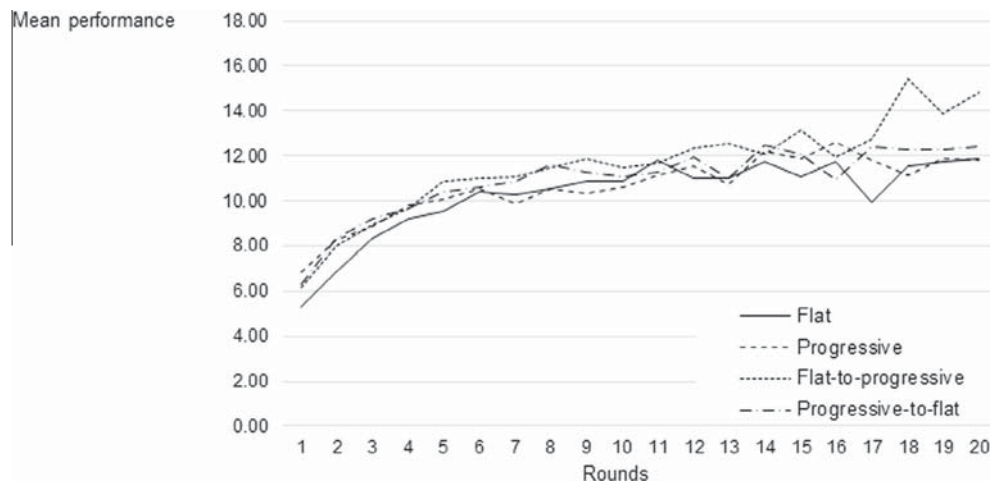


Fig. 1. Mean performance in 20 consecutive rounds by treatments.

3.1. Work performance

Work performance was measured by the scores achieved in the slider task. Fig. 1 shows the mean scores over the course of 20 rounds by experimental treatment. It indicates that – in line with the literature (Gill & Prowse, 2012) – a learning effect emerged in the first rounds of the experiment.

The significance of the monotonous increase in work performance from round to round was assessed by a one-way repeated-measures ANOVA. A significant increase in work performance was observed, $F(7.26, 1379.20) = 68.81$, $p < 0.001$, $\eta^2 = 0.27$. Contrast analyses between rounds revealed that work performance increased significantly from the first to the sixth round ($p < 0.001$ in four cases, and $p < 0.05$ in one case). After round 6 this linear increase in work performance ended and performance remained stable until the final round: in 10 of the following 14 rounds, no significant changes were observed, and in one round even a marginally significant drop in performance was recorded. Due to the initial learning effect, the observations of the first five rounds were excluded from the following analyses. Hence, to evaluate changes between the first and the second stage, work performance in rounds 6–10 was compared with performance in rounds 11–20.

First, differences in work performance in stage 1 (rounds 6–10) were tested in order to exclude any potential differences already present between the four conditions. To check this possibility, a 4×2 ANOVA was calculated, with experimental conditions (flat; progressive; flat-to-progressive; progressive-to-flat) and gender as independent factors, and mean work performance in stage 1 as a dependent variable. Accordingly, no differences in work performance between the four treatment groups were observed in stage 1, $F(3, 186) = 0.33$, $p = 0.81$, $\eta^2 < 0.01$. However, a strong effect of gender on work performance was identified, $F(1, 186) = 21.13$, $p < 0.001$, $\eta^2 = 0.10$. This effect indicates that in comparison with female participants, males performed better in the slider task ($M_{\text{FEMALES}} = 8.72$, $SD = 3.05$; $M_{\text{MALES}} = 11.18$, $SD = 3.73$). As a consequence, we controlled for gender effects throughout the following analyses.

To test the effect of a change of the tax system, the level of work performance in stage 1 (rounds 6–10) and stage 2 (rounds 11–20) was compared. Income level, based on the mean income in periods 6–10, was also controlled for in the analyses. The question arises whether pre-tax (i.e., assigned income based on performance) or post-tax income should be used in the analyses. Since both tax compliance and work performance are examined in our study, and we aimed to analyze them in a consistent way, we consider pre-tax income rather than post-tax income as an independent variable, because post-tax income (i.e., pre-tax income minus taxes minus corrections in case of detected evasion) is not independent of participants' compliance behavior. Participants acquiring less than 70 ECU per period on average were classified as belonging to the *low* income group with regard to stage 1 ($n = 58$), participants acquiring from 70 to 90 ECU were assigned to the *medium* income group ($n = 76$), and those earning more than 90 ECU on average were categorized as the *high* income group ($n = 57$). These mean income limits (70 and 90) were selected in order to determine reasonable subgroups of similar size. The stability of the income group status of the participants was examined by comparing participants' income group classification in rounds 6–10 and rounds 11–20. The vast majority of participants ($n = 145$; 76% of the sample) remained in the same income group in the two stages, $\chi^2(4) = 167.71$, $p < 0.001$. From the remaining 46 participants 23 moved one step down, 21 participants moved one step up, and only two participants moved two steps up (i.e., advanced from the lowest income group to the highest income group). This stability was also examined separately in the four experimental treatments and in all of them the income group status in the second stage was the same, $\chi^2(4) > 31.15$, $p < 0.001$. Thus, systematic differences between stage 1 and stage 2 with regard to the different income groups cannot be explained by the plain assumption of different participants in the respective groups in stage 1 and stage 2.

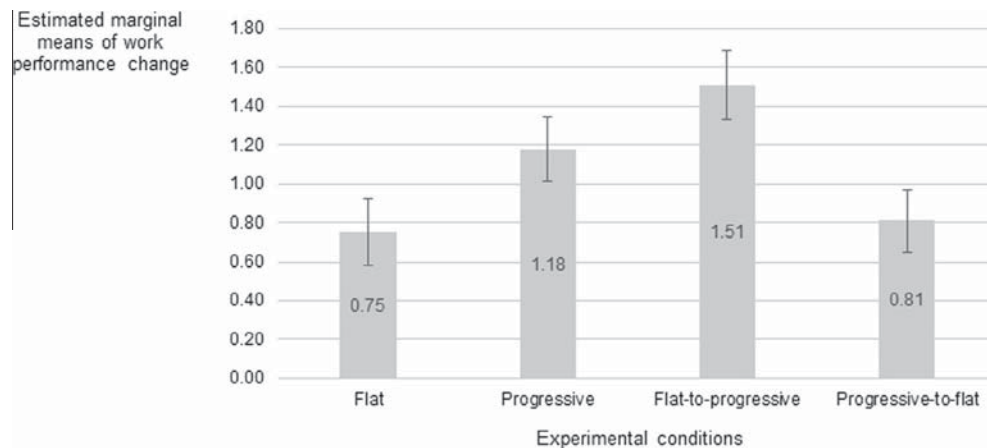


Fig. 2. Estimated mean differences and standard errors in work performance in the 4 different experimental treatments. Note: Higher scores indicate a higher work performance increase in stage 2.

In the following, the results of a 4×3 ANCOVA are presented with the four experimental treatments (flat; progressive; flat-to-progressive; progressive-to-flat) and mean income level (low; medium; high) as independent factors, mean difference between work performance in stage 1 and stage 2 as the dependent variable, and with gender as covariate. The analysis revealed a significant main effect of the experimental treatments ($F(3, 167) = 2.87, p < 0.05, \eta^2 = 0.05$), but neither the main effect of the income level ($F(2, 167) = 0.98, p = 0.38, \eta^2 = 0.01$), nor the interaction effect of treatments and income were significant ($F(6, 167) = 0.96, p = 0.46, \eta^2 = 0.03$). The gender effect did not reach significance as well, $F(1, 167) = 0.54, p = 0.46, \eta^2 < 0.01$.

Fig. 2 shows the mean differences in work performance for the four experimental conditions. As performance during stage 1 (rounds 6–10) was subtracted from the performance during stage 2 (rounds 11–20), higher numbers indicate a stronger improvement in work performance in the second stage.

The results show that the average work performance was higher in stage 2 than in stage 1, especially when the tax system either remained progressive throughout the experiment, or when a flat tax system was replaced by a progressive one. Contrast analyses revealed a significant difference between the flat and flat-to-progressive conditions ($t(167) = 1.97; p = 0.05$), and a marginally significant difference between the progressive-to-flat and flat-to-progressive conditions ($t(167) = 1.82; p = 0.07$). Hence, in comparison to the consistently flat and the progressive-to-flat conditions, work performance increased more strongly when a flat tax system was replaced by a progressive system (flat-to-progressive condition).

3.2. Tax compliance

Tax compliance was measured as the ratio of actually paid taxes compared to tax due for each of the 20 rounds of the experiment. Overall compliance during the 20 periods of the experiment was quite high at 86% ($M = 0.86, SD = 0.23$).

In order to identify differences between the four experimental conditions in the first stage, a 4×2 ANOVA was applied, with experimental conditions (flat; progressive; flat-to-progressive; progressive-to-flat) and gender as independent factors, and relative tax compliance (tax paid divided by tax due) in periods 1–10 as the dependent variable. As the learning effect in the real-effort task should not affect tax compliance, all rounds of the first stage were included in this analysis. No significant differences in tax compliance between the treatment groups were observed, $F(3, 183) = 1.88, p = 0.14, \eta^2 = 0.03$. However, a strong effect of gender was detected, $F(1, 183) = 10.34, p < 0.01, \eta^2 = 0.05$, identifying female participants as more compliant than males ($M_{\text{FEMALES}} = 0.90, SD = 0.19, M_{\text{MALES}} = 0.80, SD = 0.26$). As a consequence, we controlled for gender throughout the following analyses.

To test the effect of the tax system change on tax compliance, relative tax compliance observed in stage 1 and stage 2 was compared. A 4×3 ANCOVA with experimental conditions (flat; progressive; flat-to-progressive; progressive-to-flat) and income groups in the first stage (low; medium; high) as independent variables, difference in tax compliance between stage 1 and 2 as the dependent variable was performed. Gender and difference between the average income in periods 6–10 and periods 11–20 were included as covariates.³ Significant main effects for experimental conditions ($F(3, 166) = 2.88, p < 0.05, \eta^2 = 0.05$) and gender ($F(1, 166) = 11.16, p < 0.01, \eta^2 = 0.06$) were observed, but no effect of income level ($F(2, 166) = 1.20,$

³ It is important to control for changes of average income from periods 6–10 to periods 11–20 and possible income effects on tax compliance, since the income in periods 11–20 is subjectively evaluated as loss or gain relative to the former income, and this might have consequences on risk behavior (e.g., Kahneman & Tversky, 1979; Schepanski & Kelsey, 1990).

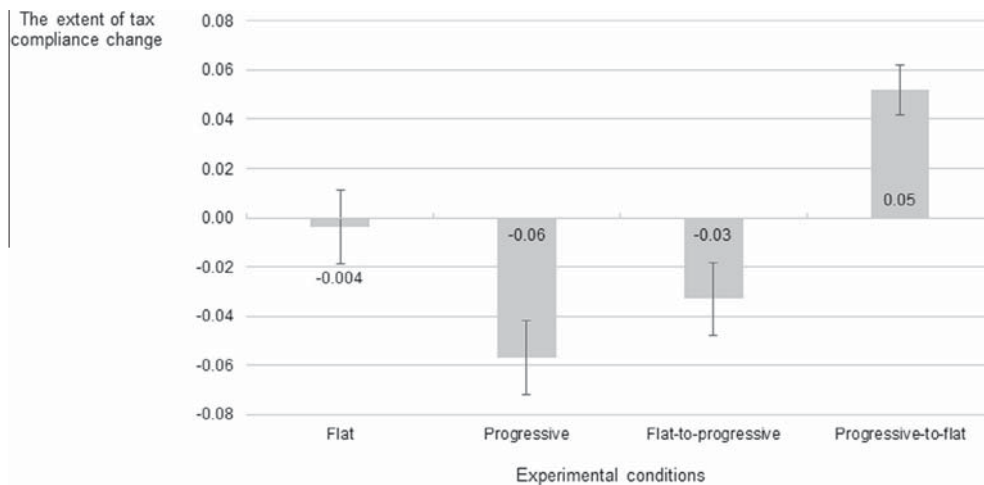


Fig. 3. Directions of change in relative tax compliance between stage 1 and stage 2. Note: Positive scores indicate an increase, negative scores a decrease in relative tax compliance in stage 2 compared to stage 1.

$p = 0.30$, $\eta^2 = 0.01$), or an interaction effect of condition \times income was found ($F(6, 166) = 1.46$, $p = 0.20$, $\eta^2 = 0.05$). The effect of difference between average income in stage 1 and stage 2 was not significant ($F(1, 166) = 0.26$, $p = 0.61$, $\eta^2 < 0.01$). Female participants were more compliant in stage 2 (estimated mean difference in compliance = 0.02, $SE = 0.02$), compared to male participants (estimated mean difference in compliance = -0.06 , $SE = 0.02$; $M_{diff} = 0.08$, $SE = 0.03$), regardless of the experimental condition.

The directions of change in relative tax compliance between stage 1 and stage 2 are depicted in Fig. 3.

Post-hoc tests revealed that the increase in the progressive-to-flat condition was significantly different from the decrease in compliance in both the progressive and flat-to-progressive conditions ($M_{diff} = 0.11$, $SE = 0.04$, $p < 0.01$ and $M_{diff} = 0.09$, $SE = 0.04$, $p < 0.05$, respectively). The difference between the flat and progressive-to-flat conditions approached only marginal significance ($M_{diff} = 0.06$, $SE = 0.04$, $p = 0.11$).

3.3. Post-experimental questionnaire results

The mean of participants' reported preferences regarding tax systems was 5.10 ($SD = 1.27$) on a 7-point scale, reflecting a preference for a progressive tax system, irrespective of experimental treatments ($F(3, 187) = 0.43$, $p = 0.73$).

Regarding simplicity, participants who completed the experiment in a flat system indicated a greater clarity of rules ($M = 6.29$; $SD = 1.25$), compared to those who completed it in a progressive condition ($M = 5.59$; $SD = 1.42$; $t(94) = -2.56$; $p < 0.05$).⁴

4. Discussion

In the present study the impact of flat and progressive tax systems on work performance and tax compliance was investigated with special attention to a change from one system to the other. In contrast to claims in the literature, the results suggest that work performance increases significantly in case of a change from a flat tax system to a progressive system. However, regarding tax compliance a reverse outcome pattern was observed: a change from a progressive tax system to a flat system increased tax compliance, compared both to a constantly progressive system and to a progressive tax system replacing a flat system. Expected income group effects could not be identified as participants' work improvements under a changing tax regime were not clearly influenced by prior income levels and advantageous changes did not result in higher tax honesty in benefitting income groups. Thus, all observed differences regarding work performance and tax compliance can be attributed to a change in the tax system, indicating contrast effects between different systems as a probable source.

The result of a greater increase in work performance when a progressive system replaces a flat system differs from the findings of Gamage et al. (2010) who report less willingness to work in a progressive system. However, Fochmann and Weimann (2013) find that participants with a lower financial status work harder in a progressive tax system. In general, participants in the present study were students and thus might predominantly have a rather low financial status. Here it is important to emphasize that the aforementioned studies did not investigate the effect of a change in the tax system. The

⁴ The need to collect data concerning perceptions of the clarity of experimental conditions appeared at a later point in the data collection. This explains the smaller sample size.

higher performance in the progressive conditions supports the assumption that a progressive tax regime can also be beneficial in the short run, and not only in the long run (see, Aghion et al., 1999; Galor & Zeira, 1993; Oishi et al., 2012; Osberg, 1995; Sala-i-Martin, 1994).

Although no significant effect of income level was confirmed, changes in work performance in the four different experimental treatments offer some interesting observations with regard to the high income group. As Table B1 (see Appendix B) illustrates, the high income group did not increase their performance even after an advantageous change, i.e., replacing a progressive tax system with a flat tax system. Although one could argue this group already performed better and could hardly improve further, the present data indicates that an observable further increase in work performance would have been possible, as a similar increase occurred in the constantly flat condition. This fact might be explained by a so-called net wage illusion (cf. Fochmann & Weimann, 2013; Fochmann, Weimann, Blaufus, Hundsdoerfer, & Kiesewetter, 2013). This phenomenon refers to defining one's effort level as if some fraction of the tax was part of one's net income, which leads to working harder for the same income if it is a net income after taxation, than for an income without taxation. In our case this translates into working less with a favorable change. While in case of high incomers this urge could counterwork the motivational power of a flat system, the same observation is missing on the opposite side of low incomers: net wage illusion of the favorable progressive change did not undermine their work motivation. Because of this asymmetry, it is questionable to attribute high incomers' lack of increase in performance with a change from a progressive to a flat system to net wage illusion.

The similar increase in performance among the income groups in the progressive context needs explanation. In the first place, we should note that modern cultures usually attribute more power to self-interest than it actually may have (Clary et al., 1998; Miller & Ratner, 1998). However, people's behaviors often diverge from their interest, either in everyday decision-making or in articulating political preferences (Chong, 2013; Sears, 1997). Some scholars attribute the modest relation between interest and behavior to lack of deep understanding of factors involved in a decision (Chong, 2013; Chong, Citrin, & Conley, 2001). Others argue for either the influencing power of personal internalized values in determining behavioral choices (Sears, 1997), or, for instance, identity-based commitment to cooperation in situations when rational competition could also be an alternative (Braithwaite & Wenzel, 2008; Gangl, Torgler, & Kirchler, 2015). In our case the fairness of a progressive tax system can be a potential explanation for the greater inclination to work, regardless of self-interest, i.e., the respective income (group). Based on the result of the post-experimental inquiry, participants' fairness preference was biased towards the progressive system. The general and direct impact of fairness on work motivation has not been addressed so far in an experimental context, so this might be an important avenue for future research.

One possible implication of our findings could be that tax policy should take into account the fact that people may react to tax systems and to changes in tax systems in a manner which does not necessarily conform to classical economic assumptions such as, for instance, the equity/efficiency trade-off (Okun, 1975).

With respect to tax compliance, participants' relative compliance levels were quite high in general throughout the experiment, with an overall mean of 86%. Thus, the compliance level was higher than in many comparable studies, which might have been due to the design. First, our design kept participants in uncertainty about both audits and fines as well as the provision of public goods until the end of the experiment. Other empirical studies also report a higher level of tax compliance when feedback on audits and fines is not given immediately (Kogler, Mittone, & Kirchler, 2016; Muehlbacher, Mittone, Kastlunger, & Kirchler, 2012). Second, participants might have perceived the series of slider tasks at the beginning of each experimental round as a series of demanding activities. If the compensation for this activity is perceived as hard-earned, this perception might result in a rather high level of tax compliance (Muehlbacher et al., 2008). Furthermore, the level of cheating is generally lower than expected based on the rational decision making model (Baldry, 1986; Elffers, 2000), although there are also other studies finding a relatively low level of intended cheating (e.g., Antonides & Robben, 1995). A robust gender effect with regard to tax compliance was also observed, showing that women were more cooperative than men in our experiment. This finding is in line with many studies in the field of tax behavior (e.g., Hasseldine, 1999; Kastlunger, Dressler, Kirchler, Mittone, & Voracek, 2010; Kogler et al., 2013).

Concerning the effect of a change of the tax system, a potential explanation for the finding that compliance was lower in the case of a progressive system in stage 2 might be the inherent difference in complexity. A less complex flat tax system might motivate tax compliance to a greater extent than a progressive system, irrespective of fairness issues. Complex tax laws are not easy to follow, understanding them increases taxpayers' administrative costs, and they consequently have a negative effect on tax compliance (Kirchler, 2007). Even a brief description of the progressive tax system with three different tax rates in the experimental instructions is more complex than a description of a flat system. Participants who evaluated the clarity of tax rules support this notion.

When evaluating the results of the study, first, it is important to emphasize that only one specific form of progressive taxation was investigated, which redistributed money rather moderately from high earners to low earners, so it remains unclear if these results are transferable to tax systems with a stronger progression. Besides this, the present study faces some other limitations. We recognize that none of the income groups faced the completely same tax duty. In our experiment the low income group pays less, the medium income group pays marginally less, and the high income group pays more in the progressive tax system, compared to the flat system. Since we did not identify an effect of income regarding both income groups and differences in income between the two experimental stages in our analyses, neither with regard to performance, nor concerning tax compliance, and, at the same time we observed an effect of tax system, it seems that

the reaction to general characteristics of a respective tax system was stronger than the influence of shifts in personal profit.

With regard to the selection of the real-effort task it is worth noting that the applied task provides a time limit. Hence, unlike in real life, participants could not improve their performance in the real-effort task by simply increasing their working time. Furthermore, it is very probable that most of the participants might have reached their maximum performance level at some point during the experiment. Nevertheless, significant differences in work performance could be observed between the different experimental conditions. Future research could apply a real-effort task without time limit, in order to better understand the impact of a change of tax system on work performance. Another limitation could be that adjusting the sliders to the middle (“balanced” or “fair”) positions in the slider task made balanced rewards (and consequently progressive taxation) more salient for our participants. This possibility could be addressed in future research. In addition, it would be important to control for participants’ risk and inequality aversion, since both factors can influence the level of tax compliance (see, e.g., Ackert, Martinez-Vazquez, & Rider, 2007; Cowell, 1992; Moser, Evans, & Kim, 1995). Finally, the experiment was conducted in Hungary, where a flat tax system was established in the year 2011. Thus, it cannot be definitely ruled out that attitudes and experiences from outside the lab may have affected behavior in the experiment.

Despite these limitations, the present study offers important implications for tax policy. In order to increase the efficiency of tax systems, the effects of these different systems on enhancing work performance as well as tax compliance must be considered simultaneously. An important conclusion is that a change from a progressive system to a flat system might increase tax compliance, but a change in the reverse order seems to be better for enhancing work performance. Therefore our results underline the necessity of re-evaluating political arguments with regard to the motivating power of tax flattening.

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Appendix A

A.1. Items measuring preference for a progressive tax system

- The only fair way is to collect more tax from rich people.
- Tax dues should be decreased from the high income group to the low one.
- Tax rates ought to be increased moving from the low income group to the high one.
- In a fair system tax rates should be increased together with the increase of the income.
- If we want the distribution of resources to be fairer, we need to deduct taxes primarily from the income of rich people.

A.2. Items measuring the clarity and simplicity of tax systems

- The tax system was clear.
- I found the tax system to be complicated (reverse coded).
- The rules of the tax system were simple.

Appendix B

Table B1.

Table B1
Work performance changes (estimated mean differences of stage 2 - stage 1) in the 4 experimental treatments by income group.

	Flat	Progressive	Flat-to-progressive	Progressive-to-flat
Low	0.35 (0.68)	1.62 (0.68)	2.34 (0.58)	1.47 (0.50)
Medium	0.86 (0.44)	1.08 (0.46)	1.71 (0.50)	0.65 (0.53)
High	1.03 (0.62)	0.83 (0.55)	0.48 (0.74)	0.31 (0.61)

Note: Standard errors are given in parentheses. Higher scores indicate higher work performance increase in stage 2.

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