How to Improve Tax Compliance? Evidence from Population-wide Experiments in Belgium

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Abstract

We study the impact of simplification, deterrence and tax morale on tax compliance. We ran four natural field experiments varying the communication of the tax administration with the universe of income taxpayers in Belgium throughout the tax process. A consistent picture emerges across experiments: (i) simplifying communication substantially increases compliance, (ii) deterrence messages have an additional positive effect, (iii) invoking tax morale is not effective, and often backfires. A discontinuity in enforcement intensity, combined with the experimental variation, allows us to compare simplification with standard enforcement measures. We find that simplification is far more cost-effective, allowing for substantial savings on enforcement costs.

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1   Introduction

Tax compliance sits at the heart of the healthy functioning of societies. It is therefore of little surprise that gaining a robust understanding of the drivers of tax compliance is an important topic in the economics literature. Tax compliance involves both the truthful reporting of taxable income and the timely payment of tax dues. The growth in third-party reporting of income has limited the ability to misreport income (see Kleven et al. (2011, 2016); Jensen (2019)).[1] Tax administrations, however, continue to devote considerable resources to the collection of taxes. In the United States the annual cost of non-compliance with individual income taxes due to nonfiling, underreporting, and underpayment is estimated to total about $319 billion (Internal Revenue Service, 2016). Closing the "tax gap" is a key objective for governments around the world, and requires to know the drivers of tax compliance and the cost effectiveness of further interventions (OECD, 2010; HM Revenue & Customs, 2018).

The classic work by Allingham and Sandmo (1972) provided a work-horse model for understanding tax compliance through pecuniary incentives that deter non-compliance. Since then, a large body of research has stressed the role of non-pecuniary motives more broadly (e.g., Kirchler (2007); Luttmer and Singhal (2014); Besley et al. (2019)), often referred to as *tax morale*. There is now scattered evidence for these different drivers of tax compliance to be important across a variety of settings (see Slemrod (2018)), but several questions remain unanswered. In particular, while information frictions and complexity are shown to be important in related contexts (e.g., Bhargava and Manoli (2015); Cox et al. (2018)), their role in the context of tax compliance is less understood.

This paper studies the simplification of the communication by the tax authority and compares its impact on tax compliance to, on the one hand, the use of deterrence and tax morale nudges and, on the other hand, the use of standard enforcement measures. We study compliance effects throughout the tax process – including the timing of tax filing, the reporting of taxable income, and the payment of taxes – for all individuals subject to personal income taxation in Belgium. We compare the potential drivers of tax compliance in the same context and put them on equal footing by varying the content of the tax letters sent by the Belgian tax authority (Federal Public Service Finance, FPS Finance). We ran four population-wide natural field experiments in collaboration with the FPS Finance over the course of three fiscal years, 2014-2016. This comprehensive approach allows us to replicate findings at different stages of the tax process and across fiscal years, and to estimate longer-term, repetition and interaction effects.

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[1]Recent empirical work investigates the misreporting of foreign income in developing countries (e.g., Alstadsæter et al. (2018)) and of taxable income in developing countries (e.g., Pomeranz (2015); Naritomi (2018)) where paper trails are missing or the enforcement capacity falls short.

The standard communication from the tax administration to taxpayers consists of a request to file a tax return and a request to pay taxes. Follow-up correspondence takes place in the event of taxpayers being late either in filing their tax return or in paying their tax dues. In order to estimate the impact of simplification and compare it to the use of deterrence or the appeal to tax morale, we leverage the different phases of communication and simultaneously test a variety of treatments. The simplification treatments shorten the length of the letters, reduce the information overload and highlight action-relevant information. The deterrence treatments add a message to the simplified letter that makes the financial penalties explicit and/or highlight the enforcement actions in case of non-compliance. The tax morale treatments add a message that highlights the public good value of tax expenditures and/or the social norms attached to filing and paying taxes on time.

Our experiments provide precise and remarkably consistent results across the tax process and the respective samples of taxpayers addressed. We find the largest compliance effects for the simplification treatments. Simplified tax filing reminders increase subsequent tax filing by 8% (relative to the baseline reminder). Simplifying the tax letter sent to all taxpayers with a positive tax bill increases timely payment by 0.7%.[2] For the late tax payers, the simplified reminder increases subsequent tax payment by as much as 23% (relative to the baseline reminder). Reducing information overload and emphasizing action-relevant information seem particularly effective in increasing compliance. We find that adding tax deterrence messages further increases tax compliance, with the average effect often being comparable in magnitude to the effect of simplification. Tax payers are successfully induced to comply by making potential penalties and their enforcement explicit, and by the encouragement to pay or file immediately to avoid these penalties. In contrast, treatments that seek to improve tax morale obtain no compliance effects and sometimes even backfire. The ineffectiveness of tax morale messages is replicated across all treatments arms, which include messages that invoke social norms and/or emphasize the social value of public expenditures. For the latter, we also experiment with a pop-up pie chart of government expenditures for online tax filers and find that it does not affect reported taxable income, but neither does it affect the perceived importance of honesty as measured in an endline survey. While the survey shows that the treatment does increase taxpayers' knowledge and appreciation of public services, this seems insufficient to increase tax compliance.

More timely tax payments do not necessarily translate into greater tax revenues. In particular, we study the full dynamics of the treatment effects on late payers, and find that they diminish over time as the tax administration takes further enforcement measures (including

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[2]Despite tax withholding one out of three taxpayers has a positive outstanding balance on their tax bill, adding up to a total of 3.8 billion euros in 2016 (about 10 percent of personal income taxes).

imposing garnishments and sending bailiffs) to eventually reach close to full compliance. The simplification treatment effects at the end of the tax cycle are 1.0pp, which is ten times smaller than their effect at the payment deadline. Still, the cost savings on follow-up enforcement imply a large return to the simplification treatment. We exploit an enforcement discontinuity, combined with our experimental variation, to disentangle their respective effects. We estimate that the simplification treatment would have increased compliance by 5.2pp in the absence of enforcement actions, and that it is six times more cost-effective than standard enforcement.

Our empirical setting thus allows us to push the frontier on the evaluation of letter treatments by comparing their compliance effects to standard enforcement actions. While nudges are by definition low-cost interventions, knowing how they compare to the standard policy levers that they complement has been a key challenge (Benartzi et al., 2017). The enforcement discontinuity allows us to compare the causal impact of regular enforcement interventions and the experimental letter treatments for the exact same people (i.e., late taxpayers around the enforcement threshold). Projected on the sample of late taxpayers, whose tax liability was about €434 million, a back-of-the envelope calculation tells us that the simplification treatment for this experiment alone could have increased tax collection by €17.5 million, or alternatively, amounted to savings on enforcement costs worth €5.4 million. In comparison, the costs of the nudge intervention were trivial (€79,511).

Our experimental design also allows us to tackle a second important concern for the evaluation of letter interventions and nudge interventions more generally, which is whether the gains are long-lived (Allcott and Rogers, 2014; Cronqvist et al., 2018). To that purpose, we repeated the experiment on the late taxpayers in two consecutive years. We first find that there are no diminishing marginal returns to repeating the treatment in that recidivists are equally responsive to a simplified letter independent of the letter type they received in the previous year. Moreover, we find that the effects extend to the following fiscal year: late payers are less likely to be late again in the next year after having received a simplified reminder letter in the first year, but this effect is offset if they received a tax morale treatment as well. These effects become smaller, and statistically insignificant two years after the intervention.[3]

The particular features of our experimental setting help advancing the growing literature on randomized controlled tax trials and the evaluation of nudge-type interventions. More generally, our paper aims to contribute to the rich literature that studies the drivers of tax

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[3]These findings extend on Brockmeyer et al. (2019), who find sustained effects from a deterrence message on firms' tax compliance in Costa Rica. These findings differ from Guyton et al. (2016), who find no long-term effects and positive returns from repeating reminders in claiming EITC.

compliance (see Slemrod (2018)):[4]

First, our paper highlights the role of complexity as a behavioral driver of tax compliance. While we do not address the complexity of the tax schedule itself (e.g., Chetty and Saez (2013), Abeler and Jäger (2015), Aghion et al. (2017)), our paper does shed new light on how simplifying communication can help to overcome information frictions and/or hassle costs associated with the process of filing and paying taxes (see e.g., Slemrod et al. (2001); Kleven and Kopczuk (2011); Hoopes et al. (2015); Dwenger et al. (2016); Benzarti (2017)). Relatedly, but in another context, Bhargava and Manoli (2015) identify barriers to the take-up of EITC benefits due to information complexity – with the mere simplification of the mailing leading to a significant increase in take-up.

Second, we do not only show that simplifying the communication of the tax administration has a substantial effect on tax compliance, but also that this effect can outweigh the effects of deterrence and tax morale interventions. Our study compares these various drivers of tax compliance in the same way, in the same setting, and on the same sample, which ensures comparability. This is particularly valuable as the results in the literature on tax morale are mixed. A number of experiments have found positive impacts from invoking social norms on tax compliance (e.g., Del Carpio (2014); Bott et al. (2017); Hallsworth et al. (2017); Perez-Truglia and Troiano (2018)), while several other experiments testing normative appeals have found null or even negative results (e.g., Blumenthal et al. (2001); Fellner et al. (2013); John and Blume (2018); Cranor et al. (2018)).[5]

Third, we ran four population-wide randomized field experiments that changed the communication between the tax authority and all income tax payers in all four stages of the tax process. This unique design strengthens the external validity of our findings (see List (2020)). Our result that simplification increases tax compliance holds along all the margins of compliance we study (e.g., filing as well as paying taxes), and across all the different parts of the tax payer population present at each stage of the tax process (e.g., late payers as well as all tax payers with a positive liability).[6] Through experimentation at scale, we

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[4]On the role of enforcement and deterrence, see reviews by Andreoni et al. (1998) and Slemrod and Yitzhaki (2002). An example of an RCT changing audit probabilities is Kleven et al. (2011). An example of an RCT changing the penalty information is Cranor et al. (2018). On the psychological, cultural, social, and normative factors underlying tax compliance, see Torgler (2007); Alm (2012); Luttmer and Singhal (2014) .

[5]For example, Hallsworth et al. (2017) find that social norms and public services messages in official reminder letters increased payment rates for overdue tax in the UK. In contrast, Cranor et al. (2018) find that invoking social norms has no compliance effects on late tax payers in Colorado, while making the penalty explicit does. Another recent example is Perez-Truglia and Troiano (2018), who find that shaming tax payers by making their non-compliance public increases compliance. However, they find no effects from providing information on others' non-compliance.

[6]We also test different variations of similar treatments and study heterogeneous treatment effects with causal forests (Wager and Athey, 2018), which helps to establish robustness and uncover underlying mechanisms.

can show that the benefits of simplification can be achieved in the usual communication of the tax authority with tax payers, rather than in a specific experimental setting, and that they can materialize for the whole population, rather than on a selected sample (Al-Ubaydli et al., 2017; Muralidharan and Niehaus, 2017). Of course, one might worry that our results would not replicate to another country with a different tax system, but the experiment was set in Belgium as we could leverage our close collaboration with the tax administration to carry out the demanding experimental design at scale. Still, the complexity of the tax process and correspondence is a widespread issue providing enormous potential for simplifying interventions to increase tax compliance in many other contexts.

The paper proceeds as follows. Section 2 presents a simple model of tax compliance and characterizes the cost-effectiveness of different interventions. Section 3 describes the context and empirical setting. Section 4 discusses the main experimental results, presents the dynamics and sheds some light on mechanisms. Section 5 analyzes the regression-discontinuity in enforcement, compares the cost-effectiveness of simplification with traditional enforcement and studies its long-term effects. Section 6 concludes.

2   Model

We consider a stylized model of tax compliance, revisiting the model of criminal behavior in Becker (1968) and its adaptation to tax evasion by Allingham and Sandmo (1972). A taxpayer decides whether to comply with their tax duties, which include the accurate reporting of their taxable income y and the timely filing and payment of taxes dues $\tau(y)$. We model tax compliance behavior as an action $\tilde{y} \in [0, y]$, which solves

$$\min_{\tilde{y} \in [0,y]} T(\tilde{y}) + \Phi_{non-compliance}(y - \tilde{y}) + \Phi_{morale}(y - \tilde{y}) + \Phi_{compliance}(\tilde{y}),$$

with $T' \geq 0$ and $\Phi'_j \geq 0$. The first and most natural cost from complying is the loss of resources from paying taxes, $T(\tilde{y})$. However, by complying the taxpayer can avoid follow-up costs enforced by the tax authority, captured by $\Phi_{non-compliance}(y - \tilde{y})$. This is the central trade-off in the deterrence framework by Allingham and Sandmo (1972), where the tax authority increases the costs of non-compliance by increasing penalties for non-compliant behavior and the probability of actual enforcement.[7] In addition to the resource costs, taxpayers may also face an intrinsic cost of non-compliance given their *tax morale* (Luttmer and Singhal, 2014), captured by $\Phi_{morale}(y - \tilde{y})$. This cost may depend on the perceived fairness

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[7]Note that the cost $\Phi_{non-compliance}(y - \tilde{y})$ can also include the resources taxpayers expend to camouflage non-compliance (see Slemrod (2018)).

of the tax system, the taxpayer's valuation of the government's use of the tax revenues, social norms determined by the compliance behavior of other tax payers, etc. Finally, we also allow for a direct cost of compliance $\Phi_{compliance}(\tilde{y})$. This term can capture the hassle cost of filing and paying taxes, the attention needed in order to take the appropriate action, additional non-monetary disutility of paying taxes (Di Tella et al., 2015), etc.

To induce compliant behavior, the tax authority needs to ensure that the cost of compliance is exceeded by its return. Assuming $T(x) = t \times x$ and $\Phi(x) = \phi \times x$, this can be represented by

$$t + \phi_{compliance} \leq \phi_{non-compliance} + \phi_{morale}.$$

The tax authority has a set of instruments available that can affect the vector of cost parameters ϕ determining the taxpayer's compliance $\tilde{y}(\phi)$. This includes standard enforcement interventions (which affect compliance through $\phi_{non-compliance}$), but also the letter interventions that we consider below. We categorize our interventions as affecting $\phi_{compliance}$ through simplifying/improving the letter design, $\phi_{non-compliance}$ through making enforcement and penalties explicit, and ϕ_{morale} by invoking tax morale.

The optimal mix of instruments will depend on their cost effectiveness, determined by their impact on tax revenues $\partial T/\partial \phi_j$ and their resource cost to the tax authority $\partial C/\partial \phi_j$. As shown by Keen and Slemrod (2017), the tax authority should equalize the marginal cost of raising an extra euro of revenue across instruments.

$$\frac{\partial C/\partial \phi_j}{\partial T/\partial \phi_j}$$

In practice, especially in the case of payment recovery, the tax authority may aim to reach near full compliance $\tilde{y}(\phi) \approx y$ and rely on stronger enforcement to recover the remaining taxes due. In that case, the return to alternative interventions is not the increase in tax revenues, but the costs savings on the standard enforcement measures. The relative cost-effectiveness of the alternative intervention can then be written as

$$\frac{\frac{\partial C}{\partial \phi_{non-compliance}}}{\frac{\partial C}{\partial \phi_j}} \times \frac{d\phi_{non-compliance}}{d\phi_j}\big|_{\tilde{y}(\phi)=y}.$$

While changes in tax-compliant behavior will only have second-order welfare effects on the tax payers by the envelope theorem, a more comprehensive welfare framework could also account for the direct effect interventions have on tax payers' welfare by affecting their resources or their tax morale (Slemrod (1995); Slemrod and Yitzhaki (2002); Chetty (2009)). Our focus is on the relative cost effectiveness of alternative tax instruments instead, which we will calculate using estimates of their compliance effects and costs compared to standard

enforcement measures.

3 Context and Design

This section presents the four experiments we study and describes the experimental samples. We also provide some background on the tax filing and payment cycle for personal income taxation in Belgium.

3.1 Tax Process

In Belgium the tax-to-GDP ratio was 44.6% in 2017, which is above the OECD average of 34.2%. We focus on individual income tax, which is the largest source of tax revenues in Belgium. In the fiscal year 2016, individual income tax raised 27.7% of overall tax revenues from 7.1 million taxpayers. Income taxes are collected solely at the federal level. There is a personal tax-free allowance which stood at 7,130 EUR and marginal taxes rise from 25 to 50%.[8] Fiscal years run from January 1st to December 31st, and the tax cycle starts in July of the year after the fiscal year in which the income has been earned. There are four main steps in the annual personal income tax cycle, as shown in Figure 1a: tax filing, filing reminders, tax payment and payment reminders. We vary the correspondence between the tax administration and taxpayer at each of these steps.

Tax filing (TF): Taxpayers can file their taxes on paper or online, either by themselves or with the help of an accountant or a tax official.[9] The online portal called "Tax-on-Web" is increasingly popular and in 2017 it was used by 3.8 million taxpayers, of which 1.7 million submitted their declarations individually. The remainder filed with the help of an accountant or a government official.

Filing reminders (TFR): Figure 1b depicts what happens when taxpayers miss the filing deadline. Filers who have not submitted by the deadline are sent a filing reminder letter, and given 14 days to file. If a taxpayer has still not filed seven days after this second deadline, the tax administration uses its own estimates to compute their tax liability. In the fiscal year 2016, about 170,000 taxpayers had not filed by the deadline, which represents about 3.5% of taxpayers who were expected to file.

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[8]In comparison, in the US, the tax-to-GDP ratio is lower (27.1%) and income taxes are more important as a share of tax revenues (38.6%). Federal marginal tax rates are lower (10 to 37%), but lower levels of government levy additional taxes.

[9]Not all taxpayers need to file. About a third of taxpayers (2.2 million in the fiscal year 2016) receive pre-filled tax returns with no further action required.

Tax payment (TP): A majority of taxpayers are taxed at the source if they are employed or pre-pay their taxes based on estimates of their tax liability if they are self-employed. A significant share of taxpayers also have taxable income below the exemption threshold and thus pay no income taxes. As a result, less than a third of taxpayers (1.9 million in the fiscal year 2016) receives a tax bill with a positive payable balance, which they need to pay within the next two months. The majority of such cases can be explained by insufficient withholding at the source in situations that made it difficult to calculate the exact tax liability (e.g. tax payers who hold several jobs, students who work part-time, etc.). Total taxes due at that stage are 3.8 billion euros.

Payment reminders (TPR): Figure 1c depicts what happens when taxpayers miss the payment deadline. Taxpayers who have not paid two months after receipt of the tax bill are sent a payment reminder. Taxpayers who still do not comply are then exposed to further enforcement actions, which start after 14 days. In the fiscal year 2016, about 220,000 taxpayers had still not paid 14 days after the deadline, and owed a total of 0.8 billion euros, which represents 12% of taxpayers who received a positive tax bill, and 21% of taxes they owed.

3.2 Experiments

We report on four experiments: one on tax filing (TF), one on tax filing reminders (TFR), one on tax payment (TP) and one on tax payment reminders (TPR) which we conduct in two consecutive fiscal years. The experiments spanned the three fiscal years (FY) from FY2014 to FY2016. The experiments involve various randomly assigned treatments that we categorize in three groups: simplification, deterrence and tax morale.

In three experiments out of four, the treatment involved simplifying the letter to communicate more clearly what the tax administration expected from taxpayers. Simplification included shortening the letter while retaining the action-relevant information. To attract the attention of the reader, important information was highlighted in color and/or placed in boxes. The simplified letters were also personalized, i.e., it was addressed to the taxpayer using his/her name.[10] As we discuss below, the exact design of the simplified letter varies across experiments as does the design of the old letter. The English versions of the old and simplified letters for the different experiments are shown in Appendix A.1 to A.6; letters were sent in Flemish, French and German depending on taxpayers' mother tongue.

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[10]Only for the TP experiment, we have within-experiment variation in the design of the simplified letter as the non-personalized address is used for a random subgroup.

The experiments also tested the effect of deterrence and tax morale through the addition of short messages in the simplified letter. The deterrence messages aimed at making the consequences of non-compliance explicit, by stating fines and tax increases and/or by mentioning follow-up enforcement. We also tested messages that encouraged immediate action to avoid the fines. The tax morale messages, on the other hand, aimed at raising compliance by increasing the desire of taxpayers to comply with social norms or to reciprocate for public goods provision. Appendix Table A.1 lists all the deterrence and tax morale messages used (translated in English).

TP Experiment: The Tax Payment experiment modified the tax bill sent to taxpayers with a positive liability: the experiment was carried out between November 2017 and May 2018 with 1,216,317 taxpayers (fiscal year 2016). All treated taxpayers received a simplified letter, only keeping action-relevant information and improving the overall outline: Appendix Figure A.1 shows the old letter, and Appendix Figure A.2 the simplified letter. For a subset of treated individuals, the letter included either deterrence messages or tax morale messages (see Panel A of Appendix Table A.1). For this experiment, outcomes include the probability of making a payment following letter receipt (extensive margin response), and the fraction paid conditional on a payment having been made (intensive margin). As baseline outcome, we use the probability of payment within 60 days after the letter was sent: 60 days is the deadline given to taxpayers to pay their outstanding debt.

TPR Experiment: The Payment Reminder experiment was conducted with taxpayers who were late in paying their tax. To validate the results and to test the effect of repeated treatments, the TPR experiment was conducted in two consecutive years: 229,751 taxpayers in 2015/16 (FY2014) and 202,730 taxpayers in 2016/17 (FY2015).[11] The treatment group received a simplified reminder letter, in which the outstanding tax liability and the deadline were highlighted and other information shortened: Appendix Figure A.3 shows the old letter, and Appendix Figure A.4 the simplified letter. Again, for different subsets of the treatment group, the letter also included deterrence and tax morale messages (see Panel B of Appendix Table A.1). The baseline outcome we consider is now the probability of payment within 14 and 180 days after reminder receipt: 14 days corresponds to the time at which enforcement actions begin.

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[11]In both trials, German speaking taxpayers, taxpayers who had raised objections to the outstanding amount they owed and taxpayers for whom the government did not have a name were not included in the randomization and received an old letter. Only debts related to the current fiscal year and letters that are first means of communication with the taxpayer (no updates on balances owed) are included in the analysis.

TF Experiment: The Tax Filing experiment was conducted in 2017 (FY2016) with 1.5 million online tax filers.[12] The tax filers were shown a pop-up pie chart either before (treatment) or after (control group) they filed their taxes. The pie chart presented the breakdown of government spending by categories (see English translation in Appendix Figure A.7).[13] The chart was accompanied by a sentence highlighting that these public services were funded by taxes.[14] We consider this as a similar treatment to the tax morale message in the other experiments. For this experiment, outcomes come from two sources: administrative data on tax compliance and answers to an online survey to which all online filers were invited. The main compliance outcome is reported taxable income. Other outcomes are tax liability, self-employed profits and expenses, expenses of salaried workers and general expenses. These are also based on declared values. Survey data is available for those who agreed to answer the questionnaire, which gauges taxpayers' knowledge and agreement with the way tax revenue is spent, and their evaluation of public services and the tax system more generally. For confidentiality reasons, only gender and age information is available for survey respondents. The survey instrument is described in Appendix A.8.[15]

TFR Experiment: The Filing Reminders experiment was conducted with 148,925 taxpayers who were late in filing their tax returns in 2016 (FY2015). The treatment group received a simplified letter, which emphasized the new filing deadline: Appendix Figure A.5 shows the old two-page long letter and Appendix Figure A.6 shows the one-page simplified letter. A subset of the treatment group received a letter which included deterrence messages (see Panel D of Appendix Table A.1).[16] For these experiments, the baseline outcome is the probability of filing within 21 days after letter receipt: 21 days is the time at which the tax administration begins to calculate the tax liability based on income estimates.

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[12]This excludes taxpayers who used an accountant or tax officer to submit their taxes via the online portal. Our dataset covers taxpayers who submitted their tax returns before mid-August 2017.

[13]The tax administration also provided a pie chart of government expenditures by region, which was available when scrolling down.

[14]For some randomly selected sub-groups, the administration added at the very bottom of the pop-up an additional sentence that either added a public goods message, mentioned penalties in general terms, or appealed to social norms in general terms (see Panel C of Appendix Table A.1). We do not find any differential effect of this second sentence and pool all treatment groups in the analysis.

[15]All outcome variables were pre-specified in the Pre-analysis Plan (AEARCTR-0002196).

[16]In the previous year (FY2014), the administration carried out a separate experiment on filing reminders, in which it included tax morale messages without simplifying the letter first. We managed to collect data from this experiment and found no effect of the treatment. Results are not reported here.

3.3 Randomization Design

The allocation of taxpayers to the different treatment groups was done in two different ways. For the TPR, the TF and the TFR experiments, it was based on the last two digits of the national identity number, which are random (see Appendix Table A.2). For the TP experiment, treatment allocation was based on the day of the month the taxpayer was born, which is also random and independent of the last digits of the national identity number (see Appendix Table A.3). There are three things to note.

First, treatment allocations for the two tax payment reminder experiments (TPR 2014 and the TPR 2015) were done in such a way that taxpayers of each treatment group in TPR 2014 had a similar probability to be assigned to each treatment group in TPR 2015. It follows that the two allocations are almost independent from each other, as in a cross-cutting randomization design.[17] Since there is significant overlap between 2014 and 2015 late payers (see Appendix Table A.4), we have sufficient power to estimate the effect of the two treatments both separately and jointly, to identify the effect of repeated treatment.

Second, treatment allocations for the TPR 2014 (tax payment reminder) and TFR 2015 (tax filing reminder) experiments coincide partially, but not completely. A potential concern could be that treatment status in one experiment affects outcomes in a following experiment. Fortunately, the two experiments were done on different target populations, since the late payers of 2014 need not be late filers in 2015. Indeed, the overlap between the two populations is small: as Appendix Table A.4 shows, only 6% of late payers for the fiscal year 2014 were also late filers for the fiscal year 2015. As a robustness check, we estimate the results of the TFR 2015 experiment controlling for the TPR 2014 treatment assignment and show that our results do not change.

Third, treatment allocation for the TF 2016 experiment again split the tax sample in two based on the two last digits of the national identity number, which made it partly, but not completely coincide with treatment allocations for the TFR and the TPR 2014 experiments. Unfortunately, to protect privacy the tax administration did not share individual identifiers for the TF 2016 experiment, which prevents us from measuring the exact overlap with the sample of the other two experiments, or controlling for assignment to previous treatments. However, since the sample of the TF experiment is much larger (1.5 million, against 150,000 for TFR and 230,000 for TPR 2014), the overlap is likely to be small.

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[17]Since 97 digits had to be allocated to 9 treatment groups in TPR 2014 and 10 treatment groups in TPR 2015, the two allocations are independent up to seven digits (11, 22, 33, 64, 75, 86 and 97). We control for TPR 2014 treatment assignment in the TPR 2015 analysis.

3.4 Population comparison

As the four experiments take place at different stages of the tax process, they test the effect of simplification, deterrence and tax morale on different parts of the taxpayer population. Table 1 shows descriptive statistics on socio-demographic characteristics of the different experimental samples, as compared to the universe of Belgian taxpayers. The Belgian personal income taxpayer is on average 49 years old, in a couple in 35% of the time and has 0.4 children (column 1). 33% of the taxpayer population lives in Wallonia and 42% speak French. On average, they owe €570, but only 28% have a positive tax liability. Taxpayers in the TP experiment have a tax liability which is by definition positive, with an average of €2676. As column 2 shows, they are older, more likely to be in a couple and have fewer children. In contrast, taxpayers in the TF experiment (column 4), who file online, are younger, and have more children. Taxpayers in the reminder experiments (TPR and TFR in columns 3 and 5) differ from the overall population in similar ways: they are more likely to be male, less likely to be in a couple, younger, more likely to speak French and to live in Wallonia. Taxpayers who are late in paying also have lower tax liability than the average (€1891). For late taxpayers, we were able to collect two additional covariates: taxable income and solvency score. The solvency score is the prediction by the tax administration of the probability that a taxpayer will not be able to pay their debts permanently, based on their tax returns in the previous year and their debt settlement history. It takes discrete values from 1 to 20 with higher values corresponding to a higher predicted level of taxpayer compliance.

4 Experimental Results

This section first presents the main results of our experiments, then discusses the timing of the effect of the different interventions, and finally explores potential mechanisms.

4.1 Baseline Results

To estimate the effect of simplification, deterrence and tax morale messages in each experiment, we take advantage of the randomization and simply regress compliance outcomes on treatment dummies and taxpayer controls. The estimating equation writes:

$$Y_i = \alpha + \beta_S S_i + \Sigma_j \beta_j T_i^j + \gamma \mathbf{X_i} + \varepsilon_i,$$

where Y_i is the relevant outcome for taxpayer i, S_i is a dummy variable equal to one for taxpayers who received a simplified letter, T_i^j are dummy variables equal to one for the different

messages added to the simplified letter, and $\mathbf{X_i}$ is a vector of taxpayer characteristics.

The outcome variable Y_i we use for our baseline specification in the tax payment experiment is whether the tax liability is paid (in full or in part) before the deadline, which is 60 days after the letter receipt. For the reminder experiments, the outcome variable is whether taxes are filed or paid before the start of follow-up interventions (respectively after 21 and 14 days for the filing and payment experiments). We consider compliance at different time horizons and at the extensive vs. intensive margin later in this section. For the tax filing experiment, the compliance variable is different in nature, since we consider total reported taxable income. Table 1 presents the full list of controls $\mathbf{X_i}$. Controls include dummies for gender, couples, age, region, mother tongue, and number of children. For experiments in which letters were sent out in waves, controls also include dummies for each wave. We include additional controls for some experiments: dummies for quintiles of amount owed (TP and TPR experiments), quintiles of income and solvency score (TPR experiment), and marital status (TF experiment).

The coefficients of interest are β_S, which identifies the effect of simplification, and β_j, which identifies the effect of adding a deterrence or tax morale message.

Figure 2 presents our baseline estimates for the simplification, deterrence and tax morale treatment. The tax payment and tax filing experiments are in the top and bottom panels respectively. The experiments on the baseline sample of tax payers/filers are on the left, while reminder experiments for the late payers/filers are on the right. The figure conveys a very clear and strong pattern across the four experiments. In the three experiments in which communication with the taxpayer was simplified (TP, TPR and TFR), it had a positive and sizeable effect on tax compliance. In the same three experiments, the deterrence messages had an additional positive effect, which is significant and can be as large as the effect of simplification. Finally, in the three experiments in which the administration tried to increase tax morale (TP, TPR and TF), it had either no effect or even reduced compliance.[18]

The regression estimates are also presented in Table 2, which has the same structure as Figure 2. The top panel (Panel A) presents the results of the tax payment experiments. Column 1 shows that simplifying the tax bill had a positive effect on the probability of paying on time, increasing it by 0.5pp. Adding a deterrence message increased the probability of paying on time further, by 0.5pp. These effects are relatively small, but significant: the combined effect of simplification and deterrence messages is 1.4% of the control mean (72.8%). The tax morale messages, however, had no additional effect on tax compliance.

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[18]Another TFR experiment was run in 2014, but unlike the main 2015 experiment, only tax morale messages were used, and without simplifying the letter. These messages had a null or negative effect on the probability of filing before enforcement actions started. These results (not shown here) confirm that tax morale messages do not improve tax compliance.

The effect of -0.1pp is sufficiently precisely estimated to rule out effects of a magnitude comparable to the simplification and deterrence treatment. Column 2 presents the results of the payment reminders experiment. The results are qualitatively similar. The effects of simplification and deterrence are again positive, but the former effect clearly dominates. That is, simplifying the reminder letters increased the probability of paying by 10pp (22.8% of the control mean), and deterrence messages had an additional positive effect of 1.2pp (2.7% of the control mean). Tax morale messages, however, had an opposite effect, slightly reducing tax compliance (-0.7pp or 1.6% of the control mean). The bottom panel (Panel B) presents the results of the tax filing experiments, which are again very similar qualitatively. The tax morale treatment in the tax filing experiment (Panel B Column 1) had no effect on declared taxable income, with the null effect again being precisely estimated. The estimates in Column 2 of Panel B show that simplification and deterrence had a large positive effect on tax compliance among late filers. Those who received a simplified letter were 2.6pp more likely to file on time. This probability increased by an additional 2.8pp for those who received a simplified letter with a deterrence message, making them 17% more likely to file on time than the control group.[19]

4.2 Dynamic Effects

We have so far reported treatment effects at one point in time, at the deadline for the tax payment experiment and before the start of enforcement actions for the reminder experiments. Using the payment and filing history, we can estimate treatment effects at any time – measured in days – after treatment. Let $Y_{i,t}$ be the tax compliance outcome of individual i at time t. As before, S_i denotes a dummy variable equal to one for taxpayers who received a simplified letter, T_i^j are treatment dummies for the addition of deterrence and tax morale messages and $\mathbf{X_i}$ denotes a vector of controls. We estimate the following equation:

$$Y_{i,t} = \alpha_t + \beta_{S,t}S_i + \Sigma_j\beta_{j,t}T_i^j + \gamma\mathbf{X_i} + \epsilon_i.$$

For the TP experiment, t ranges from the receipt of the tax bill to 60 days after, corresponding to the deadline. For the TPR experiment, t ranges from the receipt of the letter to 180 days after. Note that the deadline is two days after, and that enforcement follow-up does not start until 14 days later. For the TFR experiment, t ranges from the receipt of the letter, which gives late filers 14 days to comply, to 60 days after, when the administration has already

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[19]Appendix Table A.5 presents the results of the filing reminder experiment controlling for the treatment assignment in the payment reminder experiment. Due to the partial overlap between the two experiments, the estimates are less precise, but the magnitude of the treatment effects is similar.

automatically filed taxes for non-compliers.

Appendix Figure A.1 displays the dynamics of tax compliance in the control group - the estimated α_t - for the three experiments. In the TP experiment, the proportion of taxpayers who paid in the control group increased slowly after receipt of the tax bill, and then sharply just before the deadline, so that 72% of taxpayers met the deadline. In the TPR experiment, only a minority of late payers (17%) met the renewed deadline, and less than half of them had paid before the beginning of enforcement actions. The pattern is similar in the TFR experiment: only 25% of late filers in the control group had filed by the renewed deadline and only 34% had filed before enforcement actions began.

Figure 3 presents the dynamics of the simplification treatment, $\beta_{S,t}$. Taxpayers who received a simplified tax bill were slightly more likely to pay in the first weeks after tax bill receipt, but the difference with the control group really widened in the last week before the deadline. For the late payers, who were given a tight deadline, the simplified reminders had a strong and immediate effect on payment probability, which peaked around the time when enforcement actions started. As enforcement actions began, the control group caught up with treatment, so that the treatment effects decreased steeply, although they were still statistically significant at the end of the period. In the filing reminder experiment, the simplified reminders also had a strong and rapid effect on filing probability, which accelerated close to the deadline and peaked at the time at which enforcement actions started. Then, as income was automatically filed, the difference in manual filing remained constant between treatment and control. Taken together, these findings suggest that simplification made both the need to pay and the actual deadline more salient to taxpayers. For completeness, we also report on the dynamic effects of deterrence and tax morale messages, $\beta_{j,t}$, in Appendix Figure A.2. Across the three experiments, the additional positive effect of deterrence messages, which emphasized the penalties associated with missing the deadline, were felt gradually, and peaked at the deadline. In the Payment Reminder experiment, the negative effect of tax morale messages lingered for about a month, even after enforcement actions begun.

While our results show that the compliance effects peaked at the deadline or shortly after, they also clearly show that the effects diminished over time as enforcement actions begun. This is particularly striking in the TPR experiment. As Table 3 shows, compliance was 10pp higher in treatment than in control after 14 days (before enforcement), 6.9pp higher after 30 days, and 1pp higher after 180 days. Hence, the effect of simplification on taxes collected was in the end much smaller than the effect on compliance at 14 days would suggest. However, it declined in part because enforcement actions by the tax administration made the control group catch up with the treatment group. In Section 5, we will disentangle the compliance effect of the simplification treatment and the follow-up interventions.

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4.3 Mechanisms

The relative impact of the simplification, deterrence and tax morale treatments is remarkably consistent across experiments implemented at different stages of the tax process, and on different populations. This section explores potential mechanisms underlying this robust pattern. We present treatment variations within each category, consider their impact on alternative outcome variables and present heterogeneous effects estimated with causal forests.

Simplification Our experiments show that simplifying the tax correspondence can have a substantial impact on compliance and highlighted the dynamic patterns of the compliance effects. We briefly compare the compliance effect across experiments and across slight treatment variations within one experiment.

To compare the magnitude of the effects of simplification across experiments, it is important to keep in mind that while the simplified letters look very similar, the quality of the old letters was different. In Fparticular, in the tax payment experiment, the required actions were already grouped together and highlighted in the *old* letter, but they were made even more salient in the *new* letter (Appendix Figures A.1 and A.2). For the *old* payment reminder letter, the action-relevant information was hidden and spread out over a long, technical letter in the *old* design, also containing information that was only relevant for internal use (Appendix Figure A.3). The quality of the *old* filing reminder letter was arguably in between (Appendix Figure A.5). In the payment reminder experiment, the simplified presentation increased tax compliance by as much as 23% before the start of follow-up enforcement. This effect is larger than in the filing reminder experiment (8%) and an order of magnitude larger than in the payment experiment (0.7%). Hence, simplification was effective everywhere, but had a larger impact in contexts where the *old* letter was more complex.

Simplified letters differ from the old letters along a number of dimensions. The dynamic patterns discussed before, with larger effects at the deadline and after receipt of the letter, suggest that the simplified communication is effective in making the deadline more salient and reduces chances to forget to pay or file before. Therefore, simplification triggers an extensive margin response. In Panel A of Appendix Table A.7 we study intensive margin responses and show the treatment effects in the tax payment experiments (TP and TPR) on the fraction of the tax liability paid conditional on paying. We find positive effects of simplification at the intensive margin, but of much smaller magnitude than the extensive margin effects (and only significant in TP and TPR 2015). Simplified letters also address the taxpayer using his/her name. The tax payment experiments (TP and TPR) included treatments varying the personalization of the letter design. Specifically, in the TP experiment, some simplified letters did not address taxpayers by name (Simplified Not Personalized), and in the TPR

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FY2015 experiment, in some letters with a deterrence message the female partner in a couple was addressed before the male (Explicit Penalty FM). These variations did not make any difference (see Appendix Table A.6).

Deterrence While prior work - both theoretical and empirical - has highlighted the importance of deterrence to tackle tax evasion, our experiments show that making penalties explicit in tax correspondence can improve timely tax filing and payment too, with compliance effects between 0.5 and 3pp across the different experiments. We briefly discuss here the specific deterrence treatments and refer the reader to Appendix Table A.1 for the exact wording of the messages. The baseline deterrence treatment in the tax payment and payment reminder experiments states the average penalty (of €209) explicitly. In the filing reminder experiment, the treatment effect is somewhat larger when instead of the average penalty the deterrence message states the range of possible penalties (from €5 to €1,250) and tax rate increases (from 10 to 200%). We also find that making enforcement explicit by emphasizing the seizing of income/assets to actually collect penalties further increased compliance.[20] We additionally tested a more implicit variation of the enforcement message, which emphasized that not paying taxes would be seen as an active choice, building on Hallsworth et al. (2015). This treatment had no significant effect, potentially in line with the ineffectiveness of the tax morale treatments in our context. In contrast, a message that empasized that by taking immediate action, taxpayers could avoid penalties significantly increased compliance. In the payment reminder experiment, making the penalty explicit in combination with the immediacy message increased compliance from 1pp to 1.7pp (see TPR, FY2015 in Appendix Table A.6).[21] Also in the tax payment experiment, we ran a treatment in which we highlighted the returns to immediate action to avoid enforcement measures, which increased the treatment effect from the simplified letter from 0.4 to 0.7pp (see TP in Appendix Table A.6). This complements the earlier finding from the simplification treatment that besides making the relevant information salient, there is also a role for encouraging immediate action. We do not find an effect of deterrence at the intensive margin, when looking at the paid tax liability conditional on paying (Appendix Table A.7).

Tax Morale Our finding that tax morale messages are ineffective in raising tax compliance contrasts with some earlier studies on tax payment (e.g., Hallsworth et al. (2017) in

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[20]The Explicit Penalty+Enforcement message increases compliance 2.5pp against 1pp for the Explicity Penalty message in TPR, FY2015 - see Appendix Table A.6. The difference between the two coefficients is significant with a p-value of 0.001.

[21]The difference in treatment effects between the explicit penalty and the explicit penalty+immediacy treatment is significant with a p-value of 0.077.

the UK) and on tax filing (e.g., Bott et al. (2017) on foreign income reporting in Norway). However, a series of studies have found no effects when introducing normative appeals (e.g., Blumenthal et al. (2001), John and Blume (2018)). We both widen and strengthen the evidence by finding no or negative results at the payment and the filing stage, for the full population of tax payers / filers and on the subset of late payers / filers. Since we work on the universe of Belgium tax payers, the estimates are sufficiently precise to reject at usual significance levels that tax morale messages have effects of a magnitude comparable to the simplification and deterrence treatments. The tax morale message is also consistent across different treatment variations used in previous papers, either emphasizing the social value of the tax expenditures, or invoking the social norm of tax compliance by other Belgian taxpayers. For the online tax filing experiment, the treatment is somewhat different (i.e., the pop-up of a pie chart of tax expenditures) and so is the compliance measure (i.e., reported taxable income). However, the conclusions are the same.[22]

Tax morale messages may be ineffective because the messages were ineffective at raising tax morale, or because tax morale itself is not an important driver of tax compliance. To shed some light on the reasons why tax morale messages are ineffective, we draw from the large-scale survey implemented in combination with the online TF experiment. Taxpayers were invited to participate to an online survey immediately after they filed. The response rates were similar in treatment and control (resp. 5.15% and 5.14%): in total 79,334 tax filers completed the survey. Appendix Table A.8 presents treatment effects on survey responses. As expected, tax filers who had seen the pie chart were more likely to say that they knew how taxes were spent (column 1) and were indeed closer to the truth when asked about the share of government spending in each category (column 2).[23] Second, treated taxpayers did not only know better, they also agreed more with how taxes were spent in general (column 3). When asked to rank expenditures categories in terms of which the government should give priority to, their stated preferences were closer to the actual ranking (column 4). They also reported attaching more value to public services financed with tax revenues (column 5). In the end, however, treated tax filers were not more likely to be satisfied with the general tax system and not more likely to agree with the statement that taxes should be reported honestly (column 6 and 7). These results suggest that while the pie chart treatment was effective in improving taxpayers' knowledge and appreciation of how their taxes were spent, it fell short of improving their tax morale.

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[22]Panel B of Appendix Table A.7 shows the impact of the pie chart treatment on five other tax compliance outcomes, including self-employed profits and deductible expenses. The average treatment effect on tax compliance is precisely estimated, but always insignificant.

[23]Using respondents' responses, we construct a knowledge index equal to minus the standardized sum of absolute deviations between the stated and the actual share over all spending categories.

Heterogeneous Effects Average treatment effects can mask important heterogeneity, which is important to better target interventions, and to gauge the distributional consequences of interventions that alleviate heterogeneous frictions.[24] We focus on the payment reminder experiments, for which we were able to obtain a large set of observables (including various demographics like age, family composition, region, amount owed, taxable income and solvency score). To discipline our analysis of treatment effect heterogeneity, we use the causal forests algorithm created by Wager and Athey (2018).[25]

Figure 4 plots the dispersion of the treatment effects by treatment category (bin size is set to 0.5pp for all figures). While the figure only uncovers the heterogeneity in treatment effects based on observables, it is interesting to compare the predicted heterogeneity across treatments using the same set of observables. Indeed, we see a wide dispersion for the simplification treatment, but less so for the deterrence and tax morale ones. Moreover, the effect of the simplification treatment never turns negative, while the deterrence treatment has negative effects for some tax payers. Interestingly, the tax morale treatments seem to backfire for most taxpayers.

Using the same causal forests estimates, we can determine which observable characteristics drive the heterogeneity in treatment effects. Figures A.3a to A.3h in Appendix present the average of the different observables in each treatment effect quintile. The machine learning results identify four relevant dimensions of treatment heterogeneity: age, number of children, tax liability and solvency. We confirm that these dimensions matter everything else equal, by regressing tax compliance on interactions of the treatment with these four main characteristics, including interactions of the treatment with all other characteristics as controls. Table A.9 presents the results.[26] Simplification is more effective among taxpayers with children, who may have a harder time to track deadlines. Simplification is also more effective among taxpayers with a solvency score (as predicted by the tax administration) that is neither too high nor too low, i.e. it has little effect on people who pay their taxes readily or on people who very likely to default. Deterrence is most effective for younger taxpayers (who may be less aware of enforcement actions) and taxpayers with a lower outstanding liability (for whom the average penalty may seem high as compared to what they owe). There is no obvious pattern for gender, language, region or income.

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[24]See for example Alcott et al. (2018) in the context of using corrective sin taxes.

[25]According to Chernozhukov et al. (2018), we are in the case where the Wager and Athey (2018) method provides robust results: we have 10 dimensions of heterogeneity and about 230,000 observations $(\log(230,000) = 12 > 10)$.

[26]Appendix Table A.10 present similar results for the second TPR experiment (fiscal year 2015).

5 Simplification and Enforcement

The previous section compared the effect of different letter interventions on tax compliance. As shown in Section 2, we eventually care about how much the interventions increase tax revenues and reduce the need for follow-up enforcement by the tax authority. This section estimates the cost-effectiveness of letter interventions relative to standard enforcement actions. To that purpose, we exploit a regression discontinuity in enforcement intensity for the late tax payers, which, combined with the experimental design of the tax payment reminders, provides a unique opportunity to compare the compliance effect of letter interventions and standard policy levers for the same population and in the same setting.

5.1 Nudges vs. Enforcement

The tax administration relies on various enforcement actions to make late payers comply. The first follow-up intervention for late tax filers and taxpayers is naturally the reminder letter, which we experimentally manipulated. Individuals who do not comply after receiving the reminder are subject to further enforcement actions. Local tax administrators have some discretion in the choice of enforcement mechanisms. Commonly used tools for payment non-compliers include sending registered letters (which require confirmation of receipt), imposing garnishments and the use of bailiffs. The dynamic pattern of the treatment effects (Figure 3) showed that the letter treatments accelerated tax payments, but that their final effect on tax compliance was more modest. The timing of the decline in treatment effects corresponds to the start of the enforcement actions undertaken by the administration, which suggests that these actions are responsible for the control group catching up with treatment.

To provide causal evidence on the effect of enforcement actions, we implement a regression discontinuity design which exploits exogenous variation in enforcement intensity at a specific threshold for the outstanding tax liability. We then combine the regression discontinuity with the simplification treatment to understand both how much the simplification treatment reduced the need for follow-up enforcement and how much the follow-up enforcement reduced the impact of the simplification treatment.

As Panel (a) of Figure 5 shows, there is a clear jump in the probability of enforcement actions above the tax liability threshold (normalized to 0 for confidentiality reasons), both in the treatment and control group.[27] There is no evidence of bunching below the threshold, which confirms that it is not known to the public (see Figure A.4). Moreover, before enforcement started, the probability of paying is smooth at the cut-off in both groups. This

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[27]We exclude taxpayers with a liability exactly at the cut-off. The threshold value is a round number and the distribution of liabilities shows bunching at all round numbers in the vicinity of the threshold.

probability of paying, however, is much higher in the treatment than in the control group, which explains why both to the left and to the right of the cut-off, the treatment group is less likely to be subject to enforcement interventions. Importantly, the absence of discontinuities in the density and the pre-enforcement outcomes, both in the treatment and control group, seems to validate the use of a regression discontinuity design to estimate the causal effect of enforcement actions.

The impact of enforcement on compliance is illustrated in panel (b) of Figure 5. The fraction of taxpayers who have paid after 180 days is higher to the right than to the left of the threshold. Interestingly, compliance levels are similar in the treatment and control group to the right of the cut-off where enforcement intensity is high, while to the left where intensity is lower the treatment group is substantially more compliant.

To estimate the causal effects of the simplification treatments and the enforcement actions, we implement the standard regression discontinuity method in the control group, and add treatment dummies. Formally, let Y_i denote the tax compliance outcome of individual i, z_i their tax liability, c the tax liability cutoff. As before, S_i a dummy variable equal to one for the randomly assigned group who received the simplified letter and X_i is a vector of individual characteristics (see Table 1). The estimating equation is:

$$
\begin{aligned}
Y_i &= \alpha + \beta_S S_i + \beta_E 1\{z_i - c > 0\} + \beta_{S,E} S_i \times 1\{z_i - c > 0\} \\
&+ \delta_{C,l}(z_i - c) + \delta_{C,r} 1\{z_i - c > 0\} \times (z_i - c) + \delta_{S,l} S_i \times (z_i - c) \\
&+ \delta_{S,r} S_i \times 1\{z_i - c > 0\} \times (z_i - c) + \gamma X_i + \varepsilon_i
\end{aligned}
$$

Due to the random assignment, β_S identifies the effect of simplification at the cutoff from the left, where enforcement is weaker. Due to the regression-discontinuity, β_E identifies the effect of additional enforcement actions on tax compliance in the control group. Combining the two sources of variation, $\beta_{S,E}$ identifies the difference in treatment effects due to higher enforcement at the threshold. As in a typical regression discontinuity setting, $\delta_{C,l}$ and $\delta_{C,r}$ capture the relation between the forcing variable (tax liability) and the outcome (tax compliance) to the left and the right of the discontinuity, while $\delta_{S,l}$ and $\delta_{S,r}$ allow this relation to be different for the treatment group. An alternative interpretation is that the latter interaction terms allow for heterogeneity in treatment effects depending on the tax liability, both to the left and to the right of the cutoff.

Table 4 presents the corresponding regression results, using the Imbens-Kalyanaraman bandwidth computed for the control group in our experiment. We first consider the RDD estimates for the control group in our experiment. Column 1 confirms that the probability of enforcement increased by 15pp, from 21 to 36%, at the threshold. Before enforcement

actions begun, the payment probability, however, was smooth at the threshold (Column 2). In contrast, 180 days after reminder receipt, the payment probability increased by 6.1pp at the threshold, reaching a probability of 87% for taxpayers in the control group to the right of the threshold (Column 3). Second, we consider the effects of simplification, not just on payment, but also on follow-up enforcement. As Column 1 shows, simplification decreased the probability of any enforcement action by almost half, from 21% in the control to 13%. This is due to the fact that simplified reminders made late payers 15pp more likely to pay before enforcement actions begun: from 49 to 64% (Column 2). Note that these effects are larger than those we report for the whole late payer sample (see Table 2). After 180 days, once payment rates in the control group have increased to 81%, the treatment effects were smaller, but still significant: a 4.4pp increase (Column 3). Finally, we estimate the difference in treatment effects to the left and to the right of the threshold. While the difference $\beta_{S,E}$ is not significant, the estimate is negative and large enough to mostly offset the positive treatment effect on the probability of paying at 180 days (Column 3).[28] This confirms the graphical evidence that with high intensity enforcement the effects of simplification in the long run are virtually zero (p-value of 0.292).

While the compliance benefits of nudges seem to disappear because of follow-up interventions on non-compliant taxpayers, they do bring important benefits by saving on enforcement costs as we discuss further below. Interestingly, we can also use our results to compute the counterfactual effect of simplification after 180 days if the follow-up enforcement intervention had not taken place. Of course, in practice, the reminder letters effectiveness depends on tax payers' expectation of the follow-up enforcement by the administration. Still, to calculate the effect of simplification net of the crowd-out by the follow-up interventions, we impute the level of compliance based on the difference in compliance between high and low intensity enforcement groups scaled up by the difference in enforcement probability between them. Formally, let Y denote the payment probability, F the enforcement probability, z tax liability, c the cutoff and S letter simplification. Let the superscript F and Y denote the estimated coefficients when the dependent variable is F and Y, respectively. We compute

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[28]Note that these effects are driven by registered letters and garnishments (Appendix Table A.12).

the counterfactual effect of treatment in absence of enforcement, CE, as:

$$
\begin{aligned}
CE &= \left[E(Y|_{S=1,z<c}) - E(F|_{S=1,z<c}) \frac{E(Y|_{S=1,z>c}) - E(Y|_{S=1,z<c})}{E(F|_{S=1,z>c}) - E(F|_{S=1,z<c})} \right] \\
&- \left[E(Y|_{S=0,z<c}) - E(F|_{S=0,z<c}) \frac{E(Y|_{S=0,z>c}) - E(Y|_{S=0,z<c})}{E(F|_{S=0,z>c}) - E(F|_{S=0,z<c})} \right] \\
&= \left[\left(\widehat{\alpha^Y} + \widehat{\beta_S^Y} \right) - \left(\widehat{\alpha^F} + \widehat{\beta_S^F} \right) \frac{\left(\widehat{\beta_E^Y} + \widehat{\beta_{S,E}^Y} \right)}{\left(\widehat{\beta_E^F} + \widehat{\beta_{S,E}^F} \right)} \right] - \left[\widehat{\alpha^Y} - \widehat{\alpha^F} \frac{\widehat{\beta_E^Y}}{\widehat{\beta_E^F}} \right] = 0.077
\end{aligned}
$$

This calculation relies on a homogeneity assumption: we need that the effect of enforcement on the payment probability is the same for taxpayers who pay only when enforcement intensity increases from below to above the threshold and for taxpayers who pay even with low intensity enforcement. The counterfactual analysis suggests that in absence of the follow-up enforcement actions, the effect of simplification on the payment probability of late payers would have been 7.7pp after 180 days, which is approximately half of the effect estimated before enforcement actions begun (15pp).

5.2 Cost-Effectiveness and Welfare

We now evaluate the cost-effectiveness of the simplification treatment. We consider three closely related approaches. First, we compare the benefits of the treatment in terms of additional revenue and savings on enforcement actions to the costs of simplifying the tax correspondence. Second, we compare the cost of raising one euro of extra revenue through reminder simplification and through enforcement actions. Finally, we calculate the total cost of enforcement actions that is needed to raise the same extra revenue as the simplification treatment could.

The first method is based on experimental results only. To compute extra revenues, we estimate the effect of simplified letters on the probability of paying taxes as late as possible in the tax cycle, which is 180 days after the payment deadline, and assume that after this date the treatment effect will remain constant.[29] As Table 3 shows, the estimated treatment effect on the probability of payment at 180 days is 1pp, which we multiply by the average amount paid, conditional on a payment, at that date (€1,615) and the number of tax payers in the treatment group (205,014) to obtain total extra revenues equal to €3.16 million. To compute savings on the cost of enforcement, we estimate the effect of simplified letters on the number of enforcement actions for the three most common forms – registered letters,

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[29] After 180 days, tax filing for the next fiscal year begins: the administrative data that we use does not allow us to track outstanding debts separately from new tax liabilities.

garnishment and bailiffs. Multiplied by the cost of the respective enforcement measures, we obtain a total cost saving of €0.70 million.[30] Adding the extra revenues and costs savings on enforcement, the total benefit of the intervention equals €3.86 million. In comparison, the costs of simplification were negligible: the administration paid €69,300 for the design of the new letter, including ICT staff, data analysts, legal experts, communication staff and management, and the printing of the new (colored) letter costs an extra €0.05 per letter. The total cost of simplifying the reminder letters amounts to €79,550 and is about 50 times smaller than its benefits. Simplifying the reminder letters was thus a high return investment for the tax administration.

The second method builds on the regression discontinuity results from the previous section. Since we are able to estimate the compliance effects of the simplification treatment and the enforcement interventions separately, we can ask what the most cost-effective way is to raise one euro of extra revenue. The conceptual framework in Section 2 made clear that from an efficiency prespective, an optimal use of simplification and enforcement actions by the government should equalize the marginal cost of raising an additional euro of revenue between them. For the enforcement interventions, we first use regression discontinuity estimates for the increase in the number of registered letters (0.11) and garnishment (0.071) that were sent at the threshold (see Appendix Table A.12) and their cost (€5.7 and €17.1 respectively) to compute the cost of the increase in enforcement intensity at the threshold, which is €1.85.[31] We then use regression discontinuity estimates of the effect of enforcement intensity on the probability of payment at 180 days (from Table 4) multiplied by average payments made at the threshold to estimate additional revenues raised. The ratio of the two, i.e., the cost of raising one more euro of tax revenues through enforcement is equal to €0.31. This estimate is arguably in the range of standard estimates of the marginal excess burden of personal income taxes, suggesting that the enforcement intensity may well be desirable (Keen and Slemrod, 2017). In comparison, the resource cost of using nudge interventions is much smaller: €79,550 in total, or €0.39 per letter sent. We multiply our counterfactual estimate of the effect of simplification on the probability of payment in the absence of follow-up enforcement by the average tax payment, and obtain €7.53 extra revenue per letter. Hence the cost of raising one euro with simplified reminders is €0.05, which is six times smaller

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[30]As Appendix Table A.11 shows, the estimated treatment effects on follow-up enforcement are −0.074 for registered letters, 0.028 for garnishment actions and −0.012 for bailiffs. Multiplying these figures by the cost of each action and the number of treated taxpayers, we obtain costs savings of €86,436 for registered letters, €97,357 for garnishment and €517,318 for bailiffs.

[31]As Appendix Table A.12 shows, there is no significant increase in the use of bailiff at the threshold. As an enforcement tool, the use of bailiffs is applied to debts of relatively large amounts, while registered letters and garnishments are more often employed.

than with enforcement actions.[32] This second method confirms that simplifying reminders is far more cost-effective than intensifying enforcement.

The third method extrapolates the regression discontinuity results to the whole sample, using a back-of-the envelope calculation. At the enforcement threshold, the treatment effect was 15.1pp after 14 days and the counterfactual effect absent follow-up enforcement at 180 days was 7.7pp (Table 4). Hence for the whole sample the estimated treatment effect of 10.3pp after 14 days suggests that the counterfactual effect, in the absence of follow-up enforcement, would have been $10.3 * 7.7/15.1 = 5.3$pp at 180 days. Multiplying this figure by the amount paid by the average taxpayer and by the number of letters sent gives €17.5million of extra revenue. To obtain these extra revenues with traditional enforcement methods at the cost of 31 cents per euro raised, the government would have had to spend €5.4 million. This is again subtantially higher than the cost of the simplification intervention (€79, 550).

Regardless of the method we use for the cost-benefit analysis, simplifying letters seems highly cost effective, in itself and when compared to the alternative of using standard enforcement actions. The above calculations, however, ignore other welfare-relevant considerations that may be important when assessing the use of nudges. First of all, the letter treatments - when successful - changed the net transfers between taxpayers and the government, not only by affecting the taxes paid, but also avoiding the late penalties and interests on outstanding tax liability. Second, the nudges can affect individuals' welfare above and beyond their after-tax income. The simplified correspondence reduces compliance costs, but may also reduce the disutility of paying taxes.[33] While the same may be true for highlighting the public value of taxes paid, the opposite effect seems as plausible when using deterrence or invoking social norms.

5.3   Long-term Effects

We have shown that simplification is effective at different stages of the tax process, and for different subpopulations of income taxpayers. We have also shown that in the case of payment reminders, it is very cost effective, in itself and as compared to traditional enforcement actions. We now ask whether the simplification intervention only works once and its effects are short-lived, or to contrary, (i) has long-term effects and (ii) can be used repeatedly on the same taxpayers. To test this, we exploit the two payment reminder experiments carried out over two consecutive years.

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[32]We consider this a conservative estimate as the cost of nudging is largely driven by the fixed costs of experimental design. If these are ignored the per letter cost goes down to 0.05 making it eight times cheaper and thus lowering significantly the cost to benefit ratio of the nudging intervention.

[33]For example, Di Tella et al. (2015) show that complexity can lead people to be "conveniently upset" and use it as an excuse not to comply.

We first investigate whether simplification of communication in one fiscal year can improve compliance in subsequent years. We use the randomization in the FY2014 payment reminder experiment to estimate the effect of reminder letters on timely payment in the next two fiscal years (FY2015 and FY2016). The results are shown in column 1 of Panel A of Table 5. We find a positive and significant effect of simplification on tax compliance in the next financial year. The probability of paying taxes on time in FY2015 increased by 1.3pp. Note that this long-term effect of simplification of the reminder letter is twice as large as the short-run effect of the simplification of the tax bill itself (0.5pp increase in the probability of meeting the deadline, see column 1 in Table 2). This may be due to the fact that the simplification of the reminder letter was more substantial than the simplification of the tax bill, as discussed in the previous section. Also, the reminder letters were sent to a subsample of taxpayers who may be more sensitive to simplification. Two fiscal years after the intervention, the effect of simplification had declined to 0.5pp, and the coefficient is no longer significant (column 2 Panel A of Table 5). In contrast with simplification, the deterrence messages had no effect in the following fiscal years, but the negative effect of tax morale messages was remarkably persistent. Overall, these results suggest that small nudges can have long-term effects, and that the benefits of simplification may be even larger than our cost-benefit analysis based on the effects in one fiscal year only would suggest.

We then ask whether repeated interventions remain effective. For this we use the cross-randomization of the FY2014 and FY2015 payment reminders experiments. First, we check that the FY2014 experimental results replicate in FY2015 (see Appendix Table A.13). In FY2015 as in FY2014, simplifying tax reminders had a large positive effect on the probability of paying before enforcement starts (+10.7pp), and deterrence messages had an additional positive effect (+1.4pp), while tax morale messages had a negative effect (−1.2pp). Interestingly, mixing deterrence and tax morale messages had a significantly smaller impact than deterrence messages alone. Given that the treatment effects replicate, we can now test whether simplified letters had a larger or smaller effect for taxpayers who received them twice, i.e. whether repetition induced a reinforcement or a fatigue effect. The results are presented in Panel B of Table 5. To simplify the exposition, we estimate the effect of receiving *any* simplified letter in FY2014, in FY2015 or in both years.[34] Among taxpayers who were late twice, the estimated effect of the simplified letter in FY2015 is again large (9.9pp) and comparable to the estimated effect of a simplified letter on the late tax payers in FY2014 (Table 2) and in FY2015 (Appendix Table A.13). Interestingly, among taxpayers who were

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[34]The estimated effects of simplification are similar when we include dummy variables for the different messages and their interactions (Appendix Table A.14). Note that with the treatment interactions, the estimation is based on relatively small subsamples and the estimates become less precise.

late twice, but already received a simplified letter in FY2014, the effect of the simplified letter in FY2015 is the same (i.e., the interaction coefficient is zero). As simplification is not less effective when used repeatedly, this result suggest that fatigue effects are unimportant. However, taxpayers who were late twice are of course a selected sample of taxpayers and we know that the simplification in FY2014 itself affected the selection as it decreases the probability of being late again in FY2015. For completeness, we also report effects for the whole sample of taxpayers who were late in FY2014 (column 2) rather than just for the subsample (30%) of taxpayers who were late again in FY2015 (column 1). Also in the whole sample, we find a significant positive effect of simplification in FY2015 (2.4pp) and no evidence that simplification was less effective for those who had received the simplified letter in FY2014 (precise zero on the interaction term).

6   Conclusion

Based on a series of population-wide experiments in Belgium, we show that simplifying communication by the tax administration consistently improves tax compliance. Simplification makes taxpayers pay taxes on time and makes both late filers and late payers comply more swiftly than they would otherwise. Our results also demonstrate the added benefits from including deterrence messages in the same context but suggest that invoking tax morale does not raise compliance and often backfires. Finally, we estimate causally the costs and benefits of simplification as compared to traditional enforcement actions, and find simplification to be highly cost effective. The positive effects of simplification persist in the next fiscal year and are sustained when simplification is repeated. Making it as easy as possible to comply therefore deserves greater attention from tax administrations around the world.

Graphs

Figure 1: Tax process
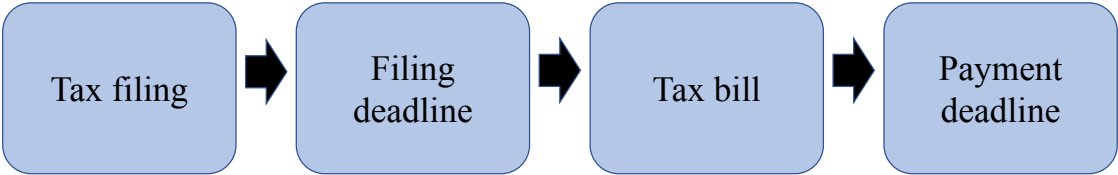
(a) Filing and payment
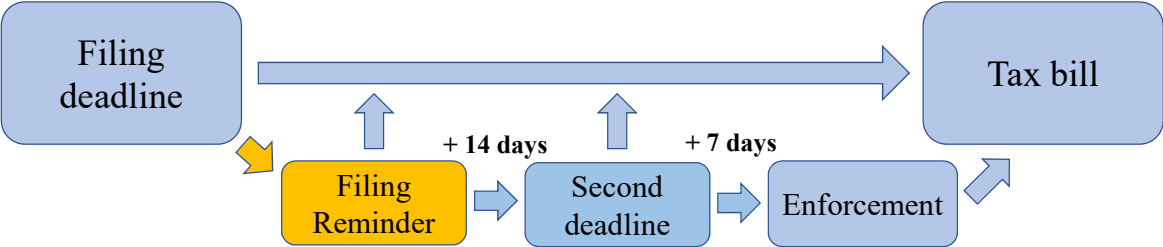
(b) Filing reminder process
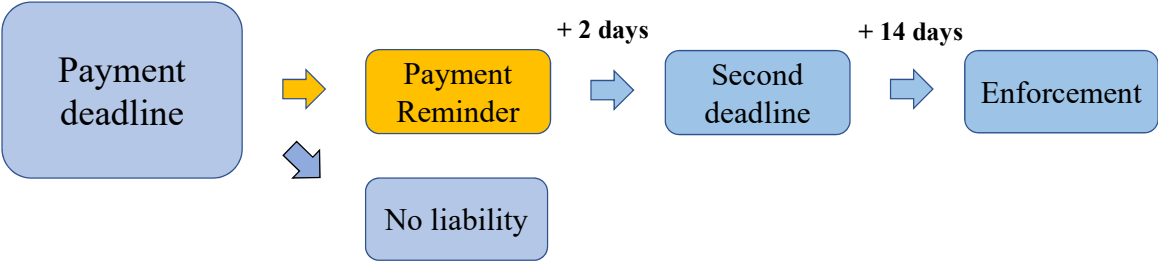
(c) Payment reminder process

Figure 2: Summary of the Main Results

(a) Tax Payment

(b) Payment Reminder

(c) Tax Filing

(d) Filing Reminder

| Simplified | Deterrence | Tax Morale | ⊢——⊣ 95% CI |
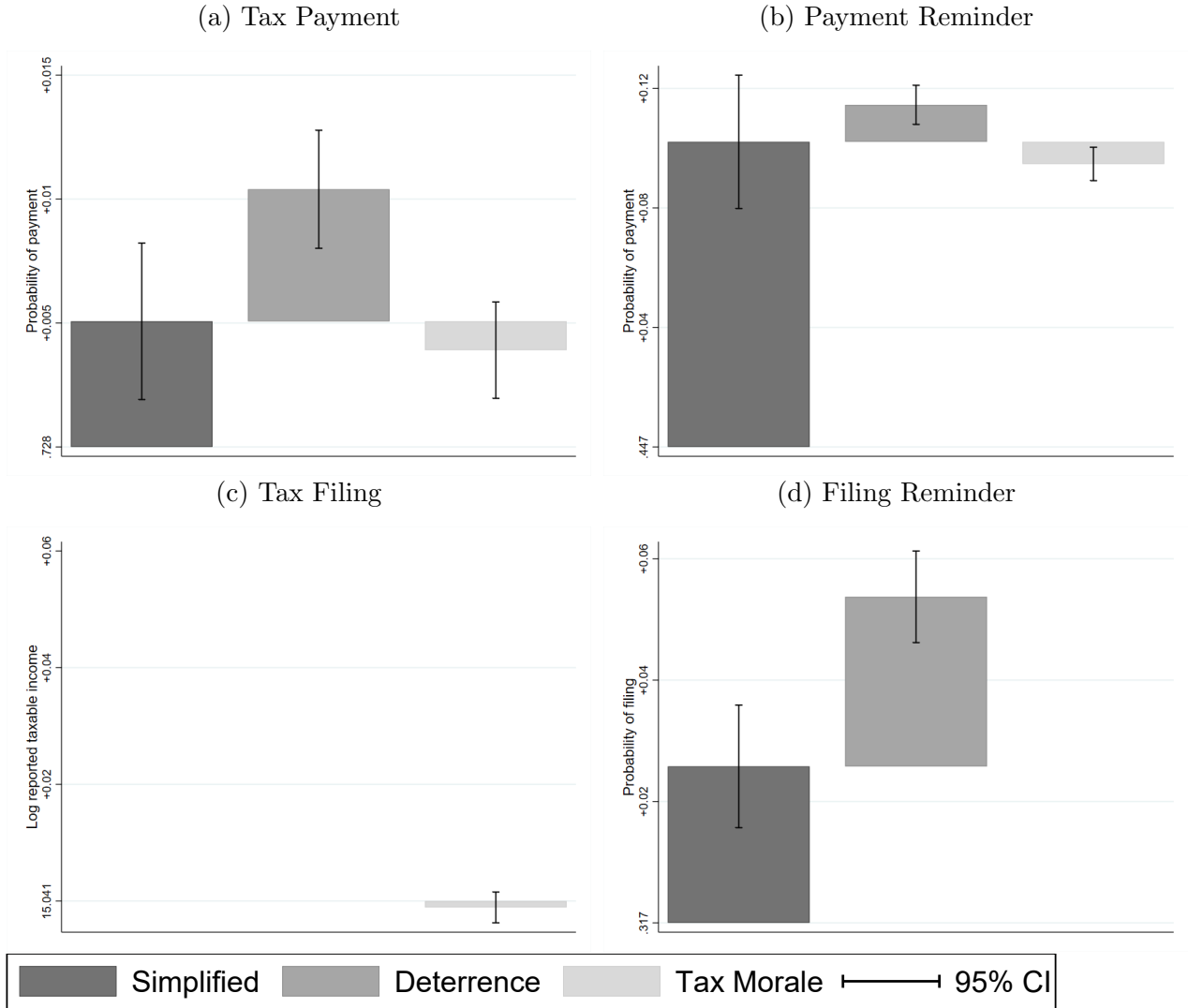
Note: The figure presents treatment effect estimates from baseline specifications for the TP (Panel (a)), TPR FY2014 (Panel (b)), TF (Panel (c)) and TFR FY2015 (Panel (d)) experiments. The outcome is partial payment probability at 60 days (deadline) in Panel (a), and at 14 days (enforcement) in Panel (b). The outcome is reported taxable income in Panel (c) and filing probability at 21 days (enforcement) in Panel (d). Control variables are listed in Table 1, for exact estimates refer to Table 2. 95% confidence intervals based on robust standard errors are plotted. Standard errors are clustered by date of letter receipt in Panels (a) and (b).

Figure 3: Dynamic Effects of Simplification

(a) Tax Payment

D - Deadline

(b) Payment Reminder

D - Deadline; E - Enforcement

(c) Filing Reminder

D - Deadline; E - Enforcement
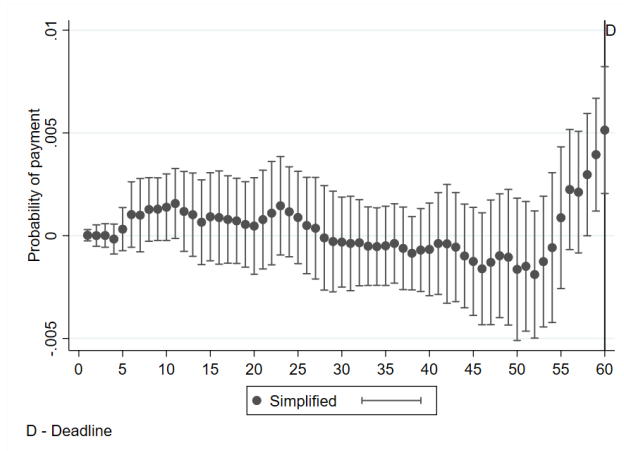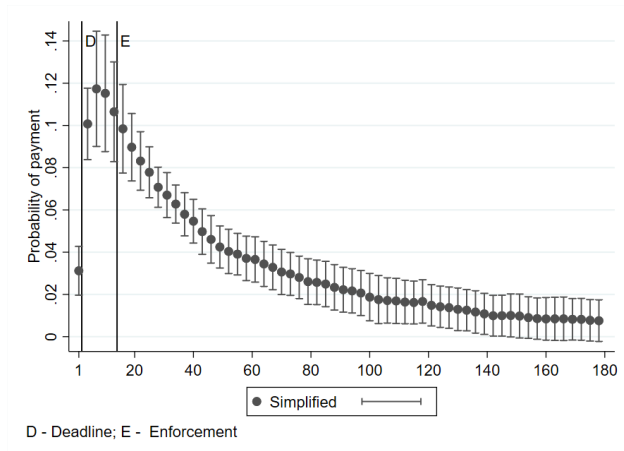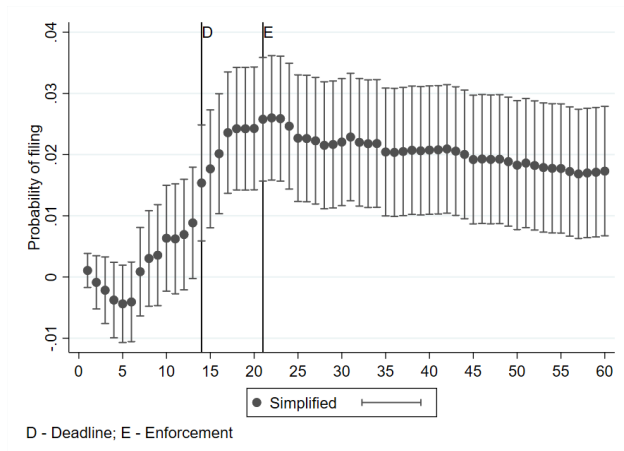
Note: The figure presents simplification treatment effect estimates by days since letter receipt for the TP (Panel (a)), TPR FY2014 (Panel (b)) and TFR FY2015 (Panel (c)) experiments. The outcome is partial payment probability in Panels (a) and (b), and filing probability in Panel (c). The vertical lines indicate the payment/filing deadline and/or the day enforcement actions start. Control variables are listed in Table 1. 95% confidence intervals based on robust standard errors plotted. Standard errors are clustered by date of letter receipt in Panels (a) and (b).

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Figure 4: Distribution of treatment effects

(a) Simplification
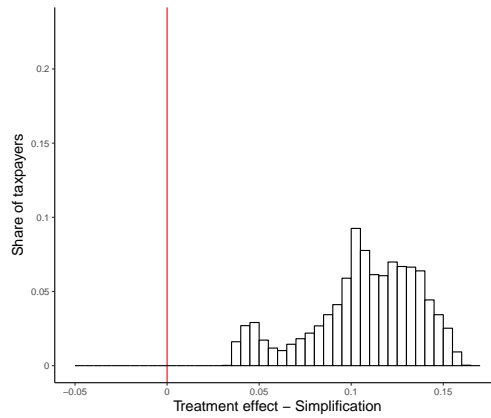
(b) Deterrence
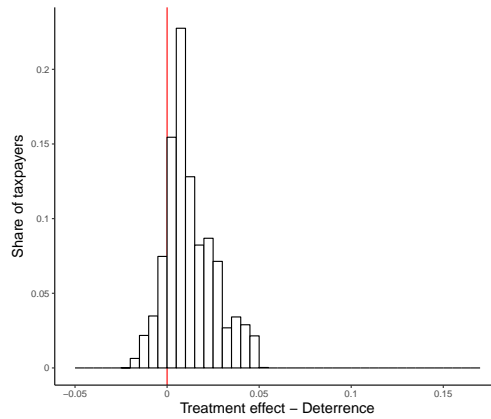
(c) Tax Morale
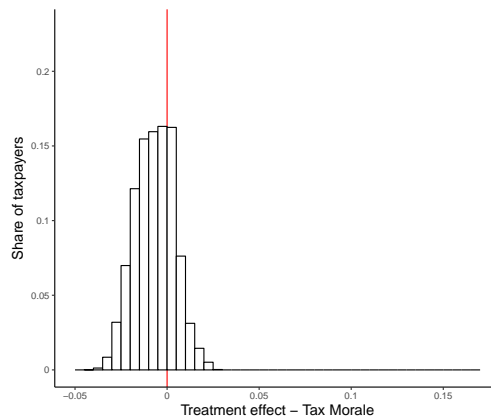
Note: The figure presents the distribution of estimated treatment effects in the TPR FY2014 experiment. It uses the generalized random forest (GRF) algorithm (Wager and Athey, 2018) as described in the text. Figures (a)-(c) differ in the definition of treatment and control groups. In Figure (a) the control is composed of taxpayers who received the old letter and the treatment of taxpayers who received a simplified letter without any additional message. In Figure (b) and (c) taxpayers who received a simplified letter without any additional message are the control group. In Figure (b) the treatment is composed of taxpayers who received a simplified letter with a deterrence message. In Figure (c) the treatment is composed of taxpayers who received a simplified letter with an added tax morale message.

Figure 5: Effects of Enforcement and Simplification

(a) Probability of Enforcement after 180 Days
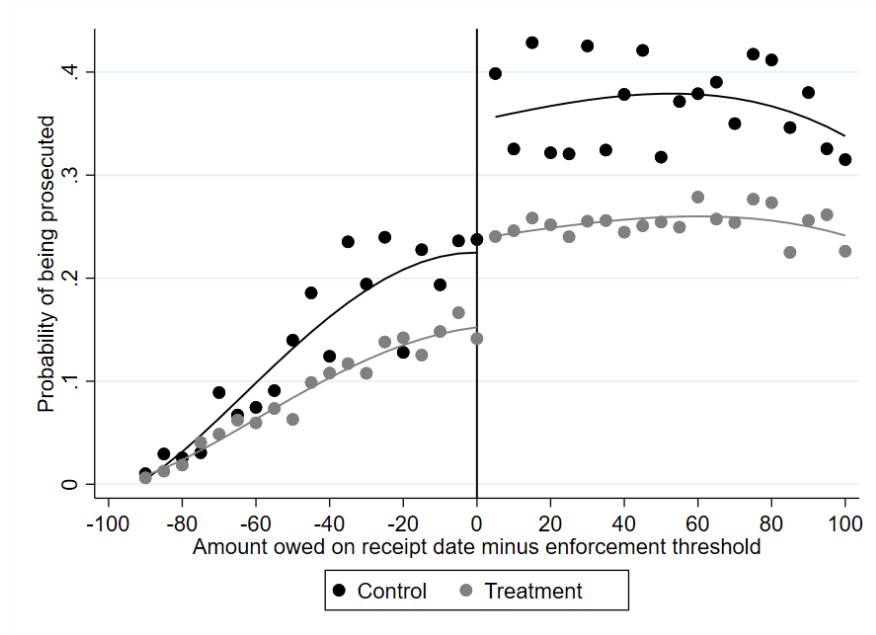
(b) Probability of Partial Payment after 180 Days
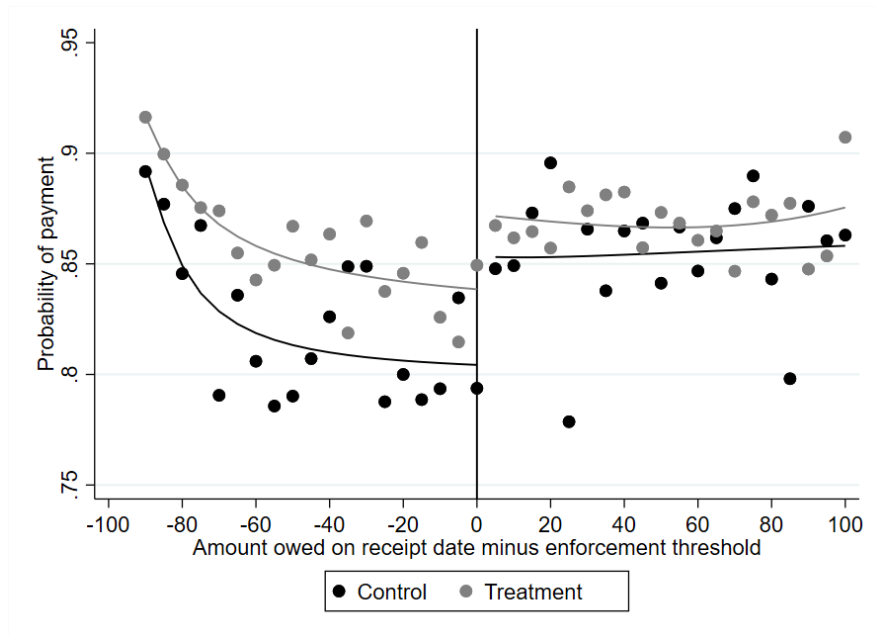
Note: The figure is based on the TPR FY2014 experiment. It shows probability of enforcement after 180 days (Panel (a)) and probability of partial payment after 180 days (Panel (b)) by initial amount owed (centred at the enforcement threshold). Bin size is set to €5 and amounts within €100 of the enforcement threshold are considered. Fractional polynomial predictions plotted.

Tables

Table 1: Summary Statistics of Control Variables

Experiment:	All taxpayers (1)	Tax Payment (2)	Payment Reminder (3)	Tax Filing (4)	Filing Reminder (5)
Demographics					
Male dummy	0.309	0.324	0.448	0.276	0.529
	(0.462)	(0.468)	(0.497)	(0.447)	(0.499)
Couple dummy	0.346	0.415	0.298	0.445	0.132
	(0.476)	(0.493)	(0.457)	(0.497)	(0.339)
Age	49.495	53.354	47.764	47.596	42.229
	(18.129)	(16.382)	(15.611)	(15.585)	(16.249)
Number of children	0.413	0.351	0.409	0.579	0.334
	(0.869)	(0.771)	(0.830)	(0.950)	(0.836)
Married dummy				0.476	
				(0.499)	
Widowed dummy				0.040	
				(0.196)	
Divorced dummy				0.156	
				(0.363)	
Region / Language					
Wallonia dummy	0.327	0.316	0.367	0.284	0.390
	(0.469)	(0.465)	(0.482)	(0.451)	(0.488)
Flanders dummy	0.570	0.596	0.525	0.637	0.390
	(0.495)	(0.491)	(0.499)	(0.481)	(0.488)
French dummy	0.421	0.386	0.473	0.357	0.592
	(0.494)	(0.487)	(0.499)	(0.479)	(0.491)
German dummy	0.006	0.011	-	0.003	0.007
	(0.076)	(0.104)		(0.051)	(0.084)
Other					
Amount owed (in '000)	0.569	2.676	1.891		
	(7.301)	(11.869)	(4.746)		
Income (in '000)			33.211		
			(28.804)		
Solvency score			11.657		
			(4.674)		
N	6,689,808	1,216,317	229,751	942,571	148,925

 Note: The table presents means and standard deviations (in parentheses) of control variables for different samples. In column 1 the sample is composed of all individual income taxpayers in FY2016. In column 2 it is the sample of the TP FY2016 experiment. In column 3 it is the sample of the TPR FY2014 experiment. In column 4 it is the sample of the TF FY2016 experiment. In column 5 it is the sample of the TFR FY2015 experiment. The base category for gender is female, for region Brussels, for language Flemish and for marital status single.

Table 2: Main Results

Panel A: Payment	Probability of some payment	
	at 60 days (deadline)	at 14 days (before enforcement)
	Tax Payment (1)	Payment Reminders (2)
Simplified (S)	0.005	0.102
	(0.001)	(0.010)
+ Deterrence	0.005	0.012
	(0.001)	(0.003)
+ Tax Morale	-0.001	-0.007
	(0.001)	(0.003)
P-values of tests:		
Simplified=Control	0.001	0.001
S+Deterrence=Simplified	0.001	0.001
S+Tax Morale=Simplified	0.167	0.083
Control mean	0.728	0.447
N	1,216,317	229,751
Panel B: Filing	Log pre-check taxable income	Probability of having filed at 21 days (before enforcement)
	Tax Filing (1)	Filing Reminders (2)
Simplified (S)		0.026
		(0.005)
+ Deterrence		0.028
		(0.004)
Tax Morale	-0.001	
	(0.001)	
P-values of tests:		
Simplified=Control		0.001
S+Deterrence=Simplified		0.001
Tax Morale=Control	0.413	
Control mean	15.041	0.317
N	942,571	148,925

Note: The table presents treatment effect estimates from baseline specifications in four separate experiments. Column 1 in Panel A presents the results of the TP experiment (taxpayers for the FY2016). Column 2 in Panel A presents the results of the TPR 2014 experiment (late taxpayers in the FY2014). Column 1 in Panel B presents the results of the TF experiment (online tax filers in the FY2016). Column 2 in Panel B presents the results of the TFR experiment (late tax filers in the FY2015). Control variables are listed in Table 1. Robust standard errors in parentheses, clustered by date of letter receipt in Panel A. p-values are adjusted for multiple hypothesis testing (List et al., 2016).

Table 3: Dynamic Effects of Payment Reminders FY2014

| | Probability of some payment | | | |
| | at 2 days (deadline) | at 14 days (before enforcement) | at 30 days (after enforcement) | at 180 days |
	(1)	(2)	(3)	(4)
Simplified	0.065	0.103	0.069	0.010
	(0.011)	(0.010)	(0.004)	(0.003)
P-values of tests:				
Simplified=Control	0.001	0.001	0.001	0.001
Control mean	0.166	0.447	0.598	0.845
N	229,751	229,751	229,751	229,751

Note: The table presents treatment effect estimates from the payment reminders experiment (TPR FY2014). Control variables are listed in Table 1. Standard errors in parentheses are clustered by date of letter receipt. p-values are adjusted for multiple hypothesis testing (List et al., 2016).

Table 4: RDD: Effect of Simplification vs. Enforcement in TPR 2014

| | Probability of enforcement at 180 days | Probability of some payment | |
| | | at 14 days (before enforcement) | at 180 days (after enforcement) |
	(1)	(2)	(3)
Simplified (S)	-0.078	0.151	0.044
	(0.021)	(0.027)	(0.014)
Enforcement (E)	0.146	0.006	0.061
	(0.027)	(0.025)	(0.018)
S * E	-0.064	0.000	-0.027
	(0.021)	(0.019)	(0.021)
P-values of tests:			
S+S*E=0	0.000	0.000	0.292
E+S*E=0	0.000	0.606	0.022
Control Mean	0.210	0.489	0.813
N	16,277	23,312	21,894

Note: The table presents simplification treatment effect estimates and enforcement RDD estimates for the TPR experiment (FY2014). Simplified is a dummy variable equal to one for taxpayers who received a simplified letter. Enforcement is a dummy variable equal to one for liability amounts above the cut-off value. Control variables are listed in Table 1. Standard errors in parentheses are clustered by date of letter receipt.

Table 5: Long-term and Repeated Treatment Effects

Panel A: Long-term Effects	Probability of being on time with payment FY+1 year (1)	Probability of being on time with payment FY+2 years (2)
Simplified (S)	0.013	0.005
	(0.003)	(0.004)
+ Deterrence	-0.002	-0.003
	(0.003)	(0.002)
+ Tax Morale	-0.009	-0.005
	(0.002)	(0.003)
P-values of tests:		
Simplified=Control	0.001	0.430
S+Deterrence=Simplified	0.493	0.509
S+Tax Morale=Simplified	0.016	0.253
Control mean	0.703	0.776
N	229,751	229,751

Panel B: Repeated Treatment	Probability of some payment at 14 days (before enforcement) in FY2015	
	Sample of Taxpayers late in FY2014 and FY2015 (1)	Sample of Taxpayers late in FY2014 (2)
Simplified 2014	-0.000	-0.001
	(0.010)	(0.005)
Simplified 2015	0.099	0.024
	(0.011)	(0.007)
S 2014 * S 2015	-0.002	0.004
	(0.009)	(0.006)
P-values of tests:		
Simplified 2014=Control	0.424	0.956
Simplified 2015=Control	0.001	0.001
S 2014*S 2015=S 2015	0.535	0.278
Control mean	0.410	0.825
N	66,705	229,751

 Note: The table presents results from the replication, long-term and repeated treatment analysis. The sample in Panel A is the universe of late payers in FY2014. In Panel B column 1 it is composed of taxpayers who were late with payment in both FY2014 and FY2015. In Panel B column 2 it is composed of the universe of late payers in FY2014. Control variables are listed in Table 1. Standard errors in parentheses are clustered by date of letter receipt. p-values are adjusted for multiple hypothesis testing (List et al., 2016).

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ONLINE APPENDIX

Figure A.1: Dynamics of Tax Compliance in the Control Group

(a) Tax Payment
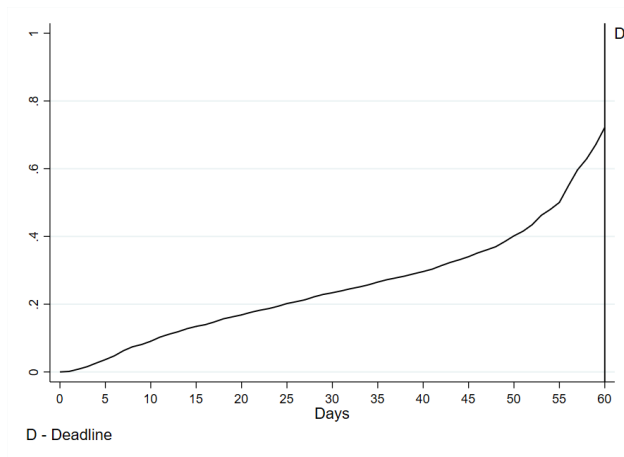
(b) Payment Reminder
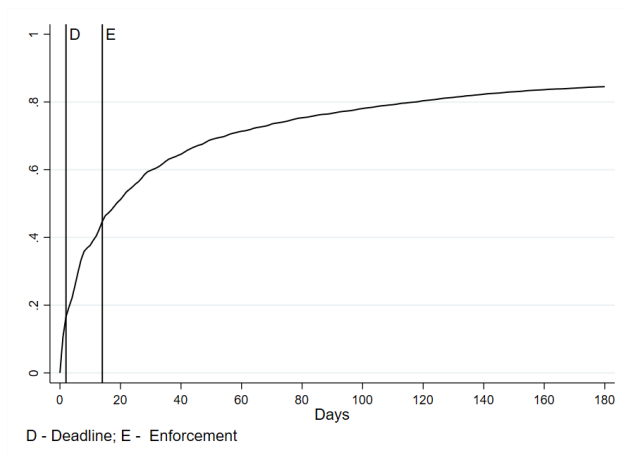
(c) Filing Reminder
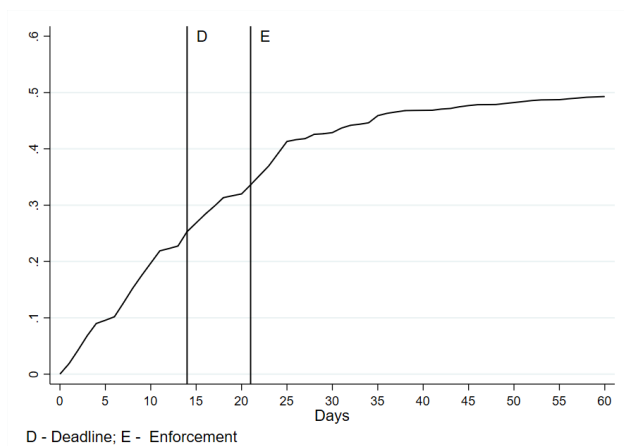
Note: The figure presents average compliance in the control group by days since letter receipt for the TP (Panel (a)), TPR FY2014 (Panel (b)) and TFR FY2015 (Panel (c)) experiments. Outcome is partial payment probability at 60 days / deadline in Figure (a) and at 14 days / enforcement start in Figure (b); outcome is filing probability at 21 days / enforcement start in Figure (c).

Figure A.2: Dynamic Effects of Deterrence and Tax Morale Messages

(a) Tax Payment
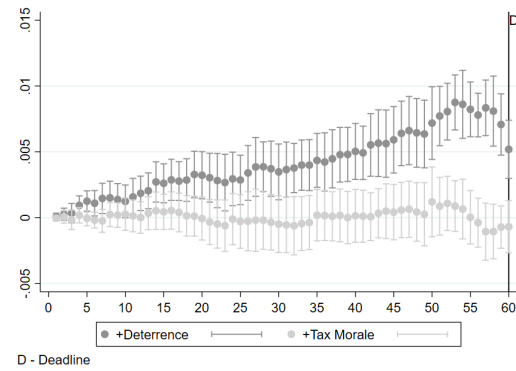
(b) Payment Reminder
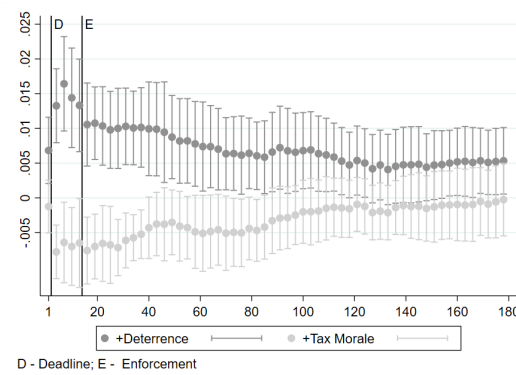
(c) Filing Reminder
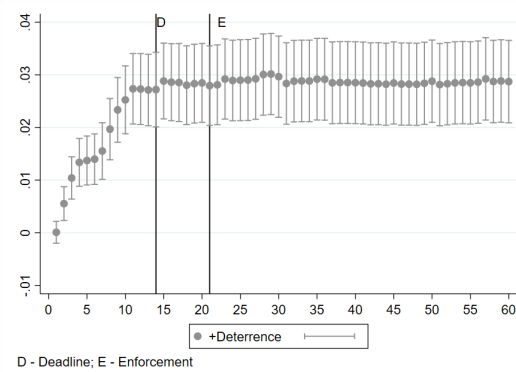
Note: The figure presents deterrence and tax morale treatment effect estimates by days since letter receipt for the TP (Panel (a)), TPR FY2014 (Panel (b)) and TFR FY2015 (Panel (c)) experiments. The outcome is partial payment probability in Panels (a) and (b), and filing probability in Panel (c). The vertical lines indicate the payment/filing deadline and/or the day follow-up enforcement starts. Controls are listed in Table 1. 95% confidence intervals based on robust standard errors are plotted. Standard errors are clustered by date of letter receipt in Panels (a) and (b).

Figure A.3: Average Value of Control Variables by Quintile of Treatment Effects

Simplification	Deterrence	Tax Morale

(a) Average Age
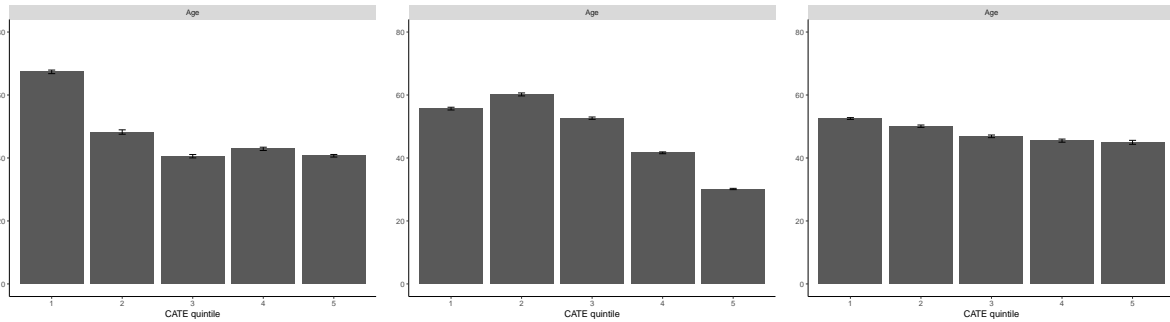
(b) Average of Gender categories
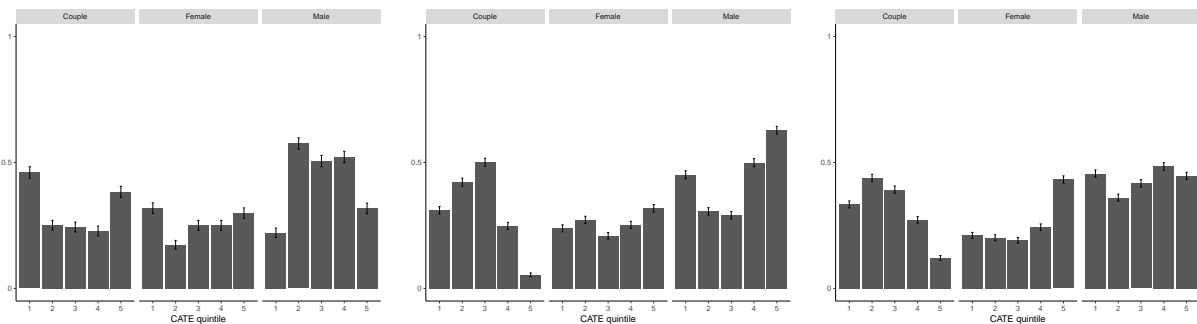
(c) Average Number of Children
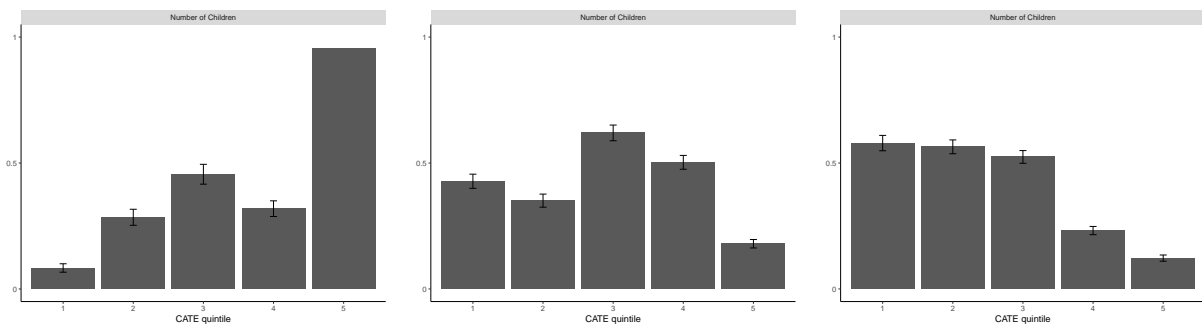
(d) Average of Language Categories
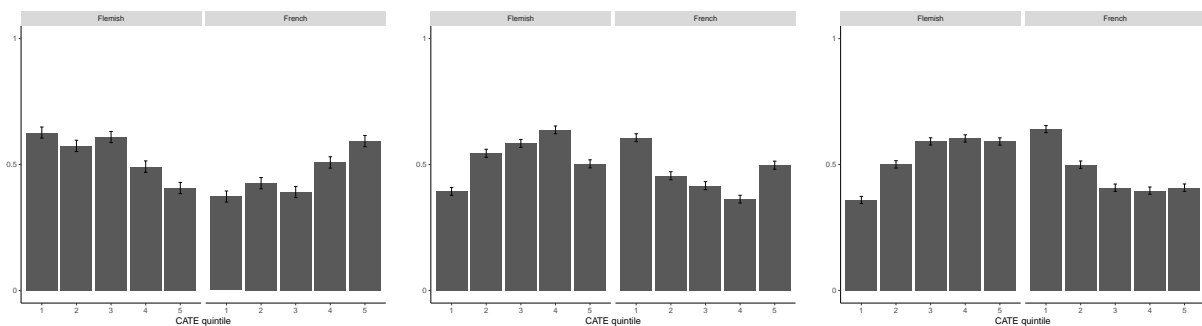
Simplification	Deterrence	Tax Morale

(e) Average of Region Categories
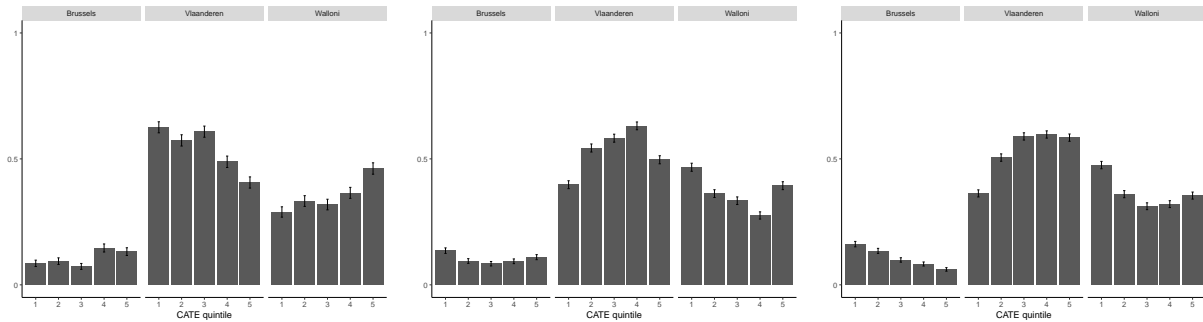
(f) Average Solvency Score
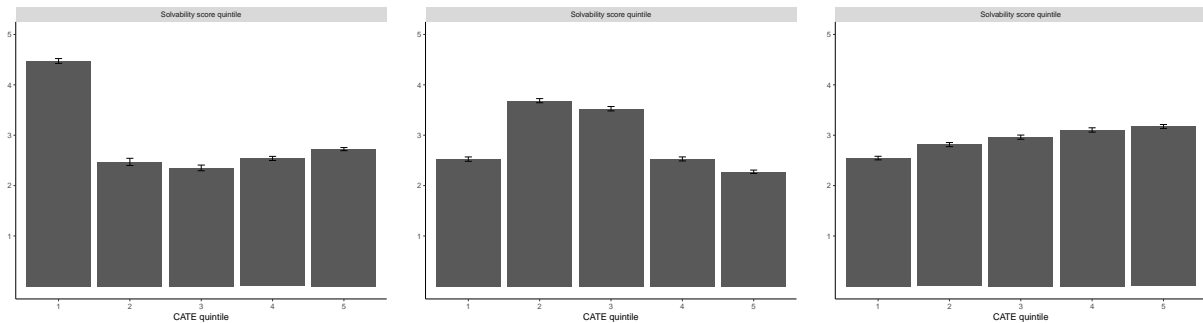
(g) Average Taxable Income
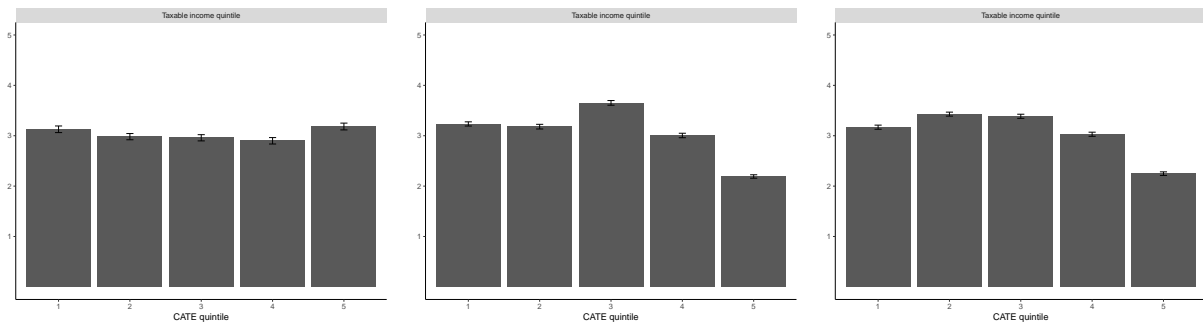
(h) Average Tax Liability
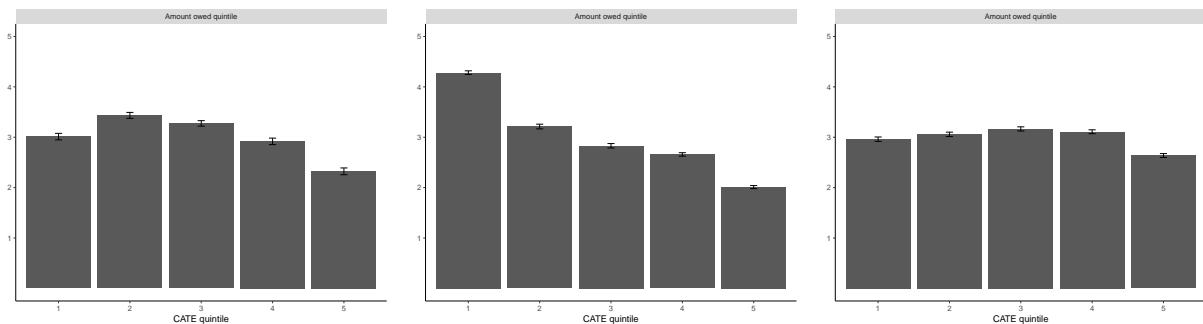
Note: The figure presents the mean and 95% confidence interval of control variables from TPR FY2014 experiment by quintile of conditional average treatment effect (CATE). These were estimated using the generalized random forest (GRF) algorithm (Wager and Athey, 2018). Three panels in each figure differ in the definition of treatment and control groups. The underlying sample of taxpayers are those in the control group and those sent a simplified letter without additional messages in the left panel, simplified letter and a simplified letter with a deterrence message in the middle panel, a simplified letter and a simplified letter with a tax morale message in right panel.

Figure A.4: RDD – Identifying Assumptions

(a) Density around the threshold - Control
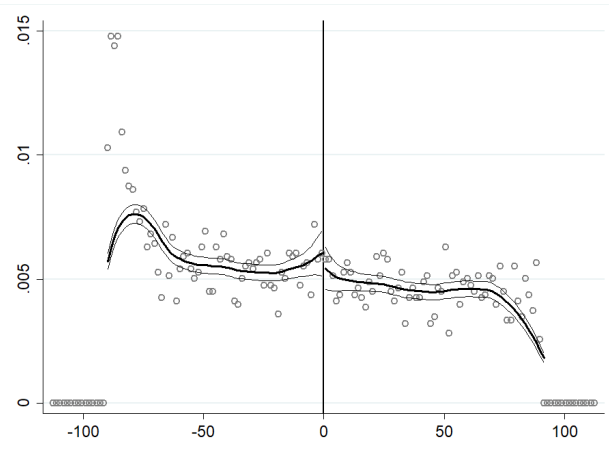
(b) Density around the threshold - Treatment
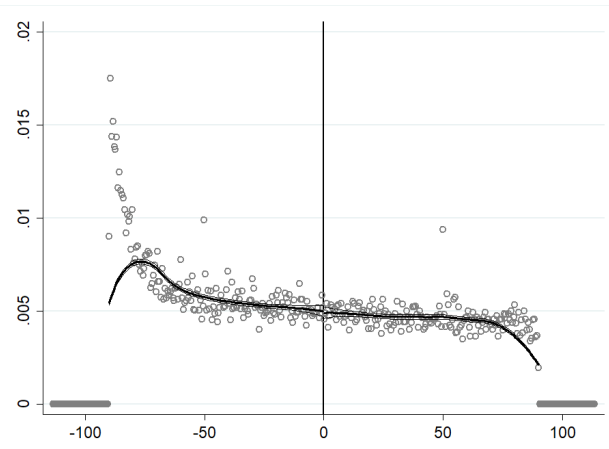
(c) Probability of Paying before Enforcement
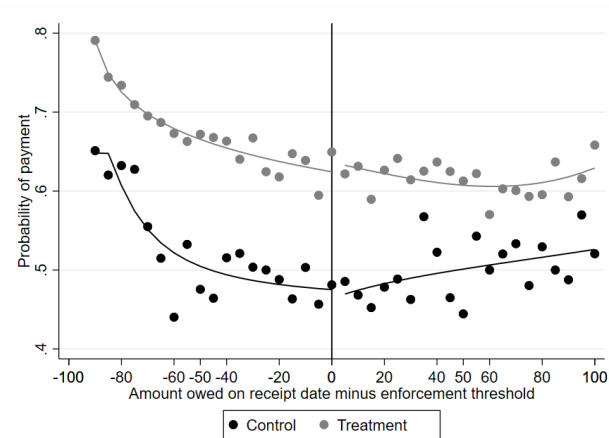
Note: The figure is based on the TPR FY2014 experiment. It explores the plausibility of the identification assumptions underlying the RDD. Panels (a) and (b) plot the average density by bin in the control and treatment group, respectively. Panel (c) plots the probability of payment before enforcement by initial amount owed (centred at the enforcement threshold). Bin size is set to €5 and amounts within €100 of the enforcement threshold are considered. Fractional polynomial predictions are plotted as well.

Figure A.5: Effects of Enforcement

(a) Probability of Enforcement at 180 days
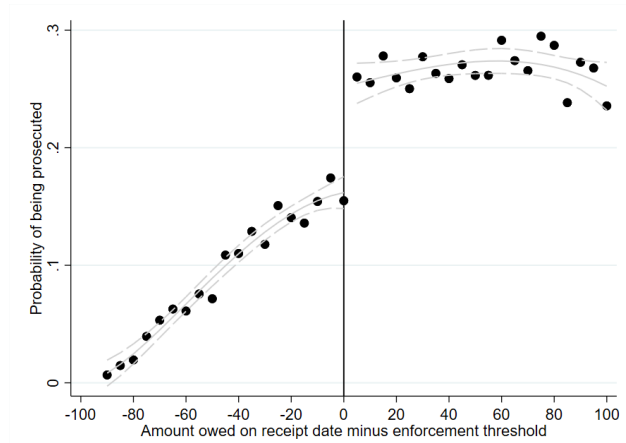
(b) Probability of Partial Payment at 14 days / enforcement start
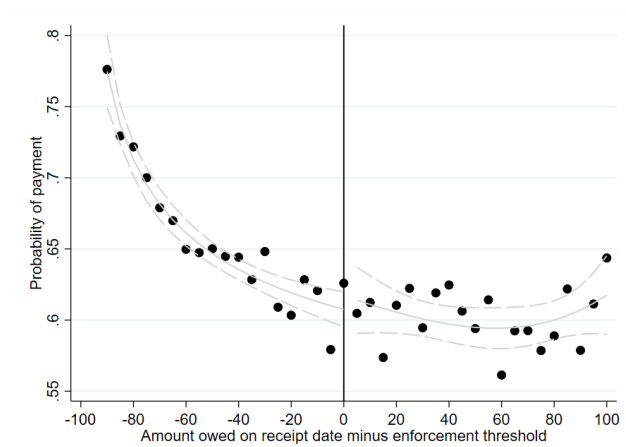
(c) Probability of Partial Payment at 180 days
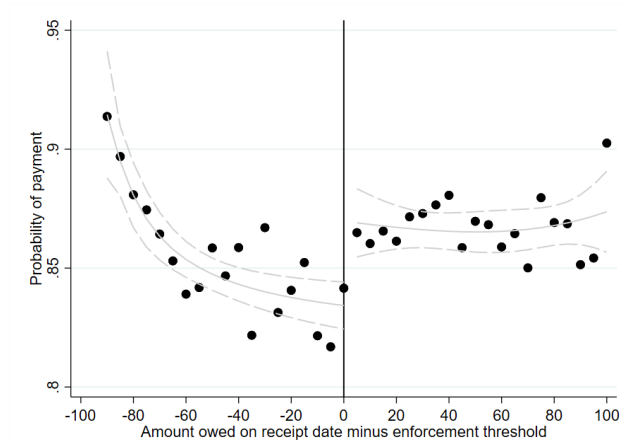
Note: The figure is based on the the TPR FY2014 experiment. It shows probability of enforcement after 180 days (Panel (a)), probability of paying after 14 days (Panel (b)) and probability of paying after 180 days (Panel (c)) by initial amount owed (centred at the enforcement threshold). Bin size is set to €5 and amounts within €100 of the enforcement threshold are considered. Fractional polynomial predictions with 95% confidence intervals plotted.

Table A.1: Deterrence and Tax Morale Messages by Experiment

Experiment / Type	Name	Message
Panel A: Tax Payment		
Deterrence	Explicit Penalty	These costs amount to 209 euros on average and can go up depending on the circumstances.
	Enforcement + Immediacy	Warning: do not wait until the deadline to pay, you run the risk of being late. If you do not pay on time, we will start actions to recover this amount.
Tax Morale	Social Norm	In Belgium 95% of taxes are paid on time.
	Public Goods	Tax revenues allow basic public services such as health care, education and law and order, to function.
Panel B: Payment Reminders		
Deterrence	Explicit Penalty (EP) (FY2014, 2015)	These costs amount to 209.00 euro on average and may, depending on the situation, rise further.
	Active Choice (FY2014)	Not paying your taxes will be seen as an active choice.
	EP + Immediacy (FY2015)	These costs amount to 209.00 euro on average and may, depending on the situation, rise further. By paying now you may still avoid these costs.
	EP + Enforcement (FY2015)	These costs amount to 209.00 euro on average and may, depending on the situation, rise further. We will undertake actions to claim tax dues that may involve seizing your income or your assets.
	EP (Female Name First) (FY2015)	Woman's name, Man's name (instead of reversed)
Tax Morale	Social Norm (FY2014, 2015)	You belong to a minority of taxpayers who did not pay their taxes within the legal period: 95% of taxes in Belgium are paid on time. Why not follow this example?
	Public Goods (FY2014)	Paying taxes guarantees the provision of essential services by the government, such as public health, education, and public safety.
	Public Goods Negative (FY2014, 2015)	Not paying taxes puts at risk the provision of essential services by the government, such as public health, education, and public safety.
Panel C: Tax Filing		
Tax Morale	Public Goods	The above pie chart illustrates how your taxes and social security contributions are spent in terms of public services.
	Public Goods Negative	The above pie chart illustrates how your taxes and social security contributions are spent in terms of public services. Incorrect and timely completion of the declaration puts at risk the essential services provided by the government.
	Public Goods + Penalty	The above pie chart illustrates how your taxes and social security contributions are spent in terms of public services. By completing your declaration correctly and in a timely fashion, you avoid further measures such as fines and tax increases.
	Public Goods + Social Norms	The above pie chart illustrates how your taxes and social security contributions are spent in terms of public services. The vast majority of people complete their declaration correctly and in a timely manner. Please follow this example.
Panel D: Filing Reminders		
Deterrence	Explicit Penalty	You risk a penalty of 50 to 1,250 euro and a tax increase of 10 to 200%.

Note: The table lists all letter messages by experiment and treatment type. In all experiments the messages where added to a personalized simplified letter.

Table A.2: Randomization Design for TPR, TF and TFR experiments (using national identity number)

TREATMENT ALLOCATION

C	Control
S	Simplification
Deterrence Messages	
EP	Explicit Penalty (EP)
AC	Active Choice (AC)
EP FM	EP (Female Name First)
EP ENF	EP+Enforcement
EP IMM	EP+Immediacy
Tax Morale Treatments	
PG	Public Goods (PG)
PGN	PG Negative (PGN)
SN	Social Norms (SN)

Digits	TPR2014	TFR2015	TPR2015	TF2016
01	C	C	C	S+PG
02	C	C	C	S+PG
03	C	C	S+EP	S+PG
04	C	C	S+EP FM	S+PG
05	C	C	S+EP ENF	S+PG
06	C	C	S+EP IMM	S+PG
07	C	C	S+PGN	S+PG
08	C	C	S+PGN+EP	S+PG
09	C	C	S+SN	S+PG
10	C	C	S+SN+EP	S+PG
11	C	S	C	S+PG
12	S	S	C	S+PG
13	S	S	S	S+PGN
14	S	S	S+EP	S+PGN
15	S	S	S+EP FM	S+PGN
16	S	S	S+EP ENF	S+PGN
17	S	S	S+EP IMM	S+PGN
18	S	S	S+PGN	S+PGN
19	S	S	S+PGN+EP	S+PGN
20	S	S	S+SN	S+PGN
21	S	S	S+SN+EP	S+PGN
22	S	S+EP	S	S+PGN
23	S+SN	S+EP	C	S+PGN
24	S+SN	S+EP	S	S+PGN
25	S+SN	S+EP	S+EP	S+PG+SN
26	S+SN	S+EP	S+EP FM	S+PG+SN
27	S+SN	S+EP	S+EP ENF	S+PG+SN
28	S+SN	S+EP	S+EP IMM	S+PG+SN
29	S+SN	S+EP	S+PGN	S+PG+SN
30	S+SN	S+EP	S+PGN+EP	S+PG+SN
31	S+SN	S+EP	S+SN	S+PG+SN
32	S+SN	S+EP	S+SN+EP	S+PG+SN
33	S+PGN	S+EP	S+SN	S+PG+SN
34	S+PGN	S+EP	C	S+PG+SN
35	S+PGN	S+EP	S	S+PG+SN
36	S+PGN	S+EP	S+EP	S+PG+SN
37	S+PGN	S+EP	S+EP FM	S+PG+EP
38	S+PGN	S+EP	S+EP ENF	S+PG+EP
39	S+PGN	S+EP	S+EP IMM	S+PG+EP
40	S+PGN	S+EP	S+PGN	S+PG+EP
41	S+PGN	S+EP	S+PGN+EP	S+PG+EP
42	S+PGN	S+EP	S+SN	S+PG+EP
43	S+PGN	S+EP	S+SN+EP	S+PG+EP
44	S+PG	S+EP	C	S+PG+EP
45	S+PG	S+EP	S	S+PG+EP
46	S+PG	S+EP	S+EP	S+PG+EP
47	S+PG	S+EP	S+EP FM	S+PG+EP
48	S+PG	S+EP	S+EP ENF	S+PG+EP
49	S+PG	S+EP	S+EP IMM	C
50	S+PG	S+EP	S+PGN	C

Digits	TPR2014	TFR2015	TPR2015	TF2016
51	S+PG	S+EP	S+PGN+EP	C
52	S+PG	S+EP	S+SN	C
53	S+PG	S+EP	S+SN+EP	C
54	S+SN+PG	S+EP	C	C
55	S+SN+PG	S+EP	S	C
56	S+SN+PG	S+EP	S+EP	C
57	S+SN+PG	S+EP	S+EP FM	C
58	S+SN+PG	S+EP	S+EP ENF	C
59	S+SN+PG	S+EP	S+EP IMM	C
60	S+SN+PG	S+EP	S+PGN	C
61	S+SN+PG	S+EP	S+PGN+EP	C
62	S+SN+PG	S+EP	S+SN	C
63	S+SN+PG	S+EP	S+SN+EP	C
64	S+SN+PG	S+EP	S+PGN	C
65	S+AC	S+EP	C	C
66	S+AC	S+EP	S	C
67	S+AC	S+EP	S+EP	C
68	S+AC	S+EP	S+EP FM	C
69	S+AC	S+EP	S+EP ENF	C
70	S+AC	S+EP	S+EP IMM	C
71	S+AC	S+EP	S+PGN	C
72	S+AC	S+EP	S+PGN+EP	C
73	S+AC	S+EP	S+SN	C
74	S+AC	S+EP	S+SN+EP	C
75	S+AC	S+EP	S+EP	C
76	S+EP	S+EP	C	C
77	S+EP	S+EP	S	C
78	S+EP	S+EP	S+EP	C
79	S+EP	S+EP	S+EP FM	C
80	S+EP	S+EP	S+EP ENF	C
81	S+EP	S+EP	S+EP IMM	C
82	S+EP	S+EP	S+PGN	C
83	S+EP	S+EP	S+PGN+EP	C
84	S+EP	S+EP	S+SN	C
85	S+EP	S+EP	S+SN+EP	C
86	S+AC+EP	S+EP	S+EP	C
87	S+AC+EP	S+EP	C	C
88	S+AC+EP	S+EP	S	C
89	S+AC+EP	S+EP	S+EP	C
90	S+AC+EP	S+EP	S+EP FM	C
91	S+AC+EP	S+EP	S+EP ENF	C
92	S+AC+EP	S+EP	S+EP IMM	C
93	S+AC+EP	S+EP	S+PGN	C
94	S+AC+EP	S+EP	S+PGN+EP	C
95	S+AC+EP	S+EP	S+SN	C
96	S+AC+EP	S+EP	S+SN+EP	C
97	S+AC+EP	S+EP	S+EP	C

Note: The table presents the randomization design of four separate experiments. TPR stands for payment reminders, TFR for filing reminders and TF to tax filing experiment. 2-digits are the last two digits of the national identity number. See Appendix Table A.1 for more details on treatment messages. All messages were added to personalized simplified letters.

Table A.3: Randomization Design for TP experiment (using Day of Birth)

Day	TP	Day	TP		Treatment Groups	
01	C	17	S + PG			
02	C	18	S + PG			
03	C	19	S + PG		**C**	**Control**
04	C	20	S + PG		**S**	**Simplification**
05	S (NP)	21	S + ENF+ IMM		**S (NP)**	**Simplification (Not Personalized)**
06	S (NP)	22	S + ENF+ IMM		**Deterrence Messages**	
07	S (NP)	23	S + ENF+ IMM		S + EP	Explicit Penalty
08	S (NP)	24	S + ENF+ IMM		S + ENF+ IMM	Enforcement+Immediacy
09	S + EP	25	S		**Tax Morale Messages**	
10	S + EP	26	S		S + PG	Public Goods
11	S + EP	27	S		S + SN	Social Norms
12	S + EP	28	S			
13	S + SN	29	S			
14	S + SN	30	S			
15	S + SN	31	S			
16	S + SN					

Note: The table presents the randomization design of the Tax Payment (TP) experiment. Day stands for the day the taxpayer was born. Simplified letters that were not personalized started with "Mr., Ms." instead of "Mr X" or "Ms X" (where X is the name of the taxpayer). See Appendix Table A.1 for more details on treatment messages. All messages were added to personalized simplified letters.

Table A.4: Overlap across experiments

	Share of taxpayers in experiment		
	Payment Reminders FY2014	Payment Reminders FY2015	Filing Reminders FY2015
Experiment	(1)	(2)	(3)
Payment Reminders FY2014	1.000	0.283	0.062
Payment Reminders FY2015	0.307	1.000	0.066
Filing Reminders FY2015	0.106	0.104	1.000

Note: The table presents the overlap between populations of taxpayers in the payment reminders (TPR) and filing reminders experiments (TFR). Each cell gives the share of taxpayers in the experiment listed horizontally that were also part of the population of the experiment listed vertically.

Table A.5: Filing Reminders FY2015 controlling for TPR FY2014 treatment assignment

	Probability of having filed 21 days (before enforcement) (1)
Simplified (S)	0.019
	(0.011)
+ Deterrence	0.029
	(0.010)
P-values of tests:	
Simplified=Control	0.072
S+Deterrence=Simplified	0.005
Control mean	0.317
N	148,925

Note: The table presents treatment effect estimates from filing reminders experiment (TFR FY2015). Control variables are listed in Table 1. Additional controls include dummies for the treatment the taxpayer would have received if had been late with payment in the previous fiscal year. Robust standard errors in parentheses.

Table A.6: Payment Experiments: Individual Letter Effects

Probability of some payment	at 14 days (before enforcement)		at 60 days (deadline)
	TPR FY2014 (1)	TPR FY2015 (2)	TP (3)
Simplification Treatments			
Simplified (S)	0.102 (0.010)	0.107 (0.004)	0.005 (0.002)
+ Not Personalized (NP)			0.001 (0.002)
Deterrence Treatments			
+ Explicit Penalty (EP)	0.020 (0.002)	0.009 (0.003)	0.004 (0.001)
+ Active Choice (AC)	0.001 (0.004)		
+ EP + AC	0.016 (0.005)		
+ EP + Enforcement		0.024 (0.003)	
+ EP + Immediacy		0.017 (0.004)	
+ EP FM		0.008 (0.005)	
+ Enforcement + Immediacy			0.007 (0.001)
Tax Morale Treatments			
+ Public Goods Negative (PGN)	-0.007 (0.004)	-0.014 (0.003)	
+ Public Goods Positive (PGP)	-0.014 (0.004)		-0.002 (0.001)
+ Social Norms (SN)	-0.002 (0.004)	-0.011 (0.004)	0.001 (0.001)
+ SN + PGP	-0.006 (0.004)		
Deterrence & Tax Morale Treatments			
+ EP + SN		0.006 (0.003)	
+ EP + PGN		0.005 (0.005)	
P-values of tests:			
Simplified=Control	0.001	0.001	0.001
S + NP = S			0.498
S + EP = S	0.001	0.451	0.017
S + AC = S	0.859		
S + EP + AC = S + EP	0.491		
S + EP + Enforcement = S + EP		0.001	
S + EP + Immediacy = S + EP		0.077	
S + EP FM = S + EP		0.916	
S + Enforcement + Immediacy = S			0.001
S + PGN = S	0.61	0.001	
S + PGP = S	0.007		0.262
S + SN = S	0.92	0.375	0.651
S + SN + PGP = S	0.562		
S + EP + SN = S + EP		0.956	
S + EP + PGN = S + EP		0.991	
Control mean	0.447	0.418	0.728
N	229,751	202,730	1,216,317

Note: The table presents treatment effect estimates of messages in the two payment reminder experiments (TPR 2014 in column 1 and TPR 2015 in column 2) and in the tax payment (TP) experiment (column 3). Control variables are listed in Table 1. Standard errors in parentheses are clustered by date of letter receipt. p-values adjusted for multiple hypothesis testing (List et al., 2016).

Table A.7: Treatment Effects on Other Outcomes

Panel A: Tax Payment	TPR 2014	TPR 2015	TP
	% Liability Paid before Enforcement (1)	% Liability Paid before Enforcement (2)	% Liability Paid before Deadline (3)
Simplified (S)	0.003	0.011	0.002
	(0.002)	(0.004)	(0.001)
+ Deterrence	0.002	0.002	-0.000
	(0.001)	(0.002)	(0.001)
+ Tax Morale	0.000	-0.001	-0.000
	(0.002)	(0.002)	(0.001)
+ Deterrence + Tax Morale		0.003	
		(0.002)	
P-values of tests:			
Simplified=Control	0.124	0.120	0.001
S+Deterrence=Simplified	0.318	0.987	0.827
S+Tax Morale=Simplified	0.416	0.472	0.708
S+Deterrence+Tax Morale=S+Deterrence		0.715	
Control mean	0.915	0.900	0.941
N	124,032	105,934	892,310
Panel B: Tax Filing	Log pre-check total tax due (1)	Log self-employed profits (2)	Log self-employed expenses (3)
Tax Morale	-0.003	0.010	-0.014
	(0.003)	(0.016)	(0.014)
P-values of test:			
Tax Morale=Control	0.584	0.750	0.776
Control mean	13.446	12.767	12.940
N	850,778	64,606	44,919
Panel B (continued)	Log salaried expenses (4)	Log general expenses (5)	
Tax Morale	-0.004	-0.006	
	(0.006)	(0.005)	
P-values of test:			
Tax Morale=Control	0.844	0.526	
Control mean	13.155	11.082	
N	39,176	290,551	

Note: The table presents treatment effect estimates for other outcomes of interest in the tax payment (TP FY2016 Panel A) and the tax filing (TF FY2016 Panel B) experiments. In Panel A the sample consists of late payers who had made some payment before enforcement started. Control variables are listed in Table 1. Robust standard errors in parentheses, clustered by date of letter receipt in Panel A. p-values adjusted for multiple hypothesis testing (List et al., 2016).

Table A.8: Tax Filing: Survey Results

	Knows how taxes are spent	Knowledge index	Agrees with how taxes are spent	Agreement index	Values public services	Satisfied with tax system	Agrees should be honest
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tax Morale	0.114	0.101	0.032	0.025	0.045	0.006	0.009
	(0.008)	(0.010)	(0.008)	(0.009)	(0.008)	(0.008)	(0.008)
P-values of test:							
Tax Morale=Control	0.000	0.000	0.000	0.025	0.000	0.442	0.382
N	66,530	47,194	66,430	47,897	66,698	66,874	66,607

Note: The table presents treatment effect estimates from the analysis of survey responses in the tax filing experiment (TF FY2016). Outcomes are standardized using mean and standard deviation of control group responses. Control variables are dummies for gender and age categories. Robust standard errors in parentheses. p-values adjusted for multiple hypothesis testing (List et al., 2016).

Table A.9: Heterogeneous Effects – Payment Reminder Experiment FY2014

Probability of payment before enforcement			
Simplified (S)	0.041		
	(0.040)		
+ Deterrence	0.080		(continued)
	(0.030)		
+ Tax Morale	0.090	Solvency score Q3 * Simplified	0.056
	(0.025)		(0.014)
Age 31-40 * Simplified	0.012	* S + Deterrence	-0.004
	(0.013)		(0.008)
* S + Deterrence	-0.011	* S + Tax Morale	-0.004
	(0.012)		(0.011)
* S + Tax Morale	-0.006	Solvency score Q4 * Simplified	0.024
	(0.010)		(0.016)
Age 41-50 * Simplified	0.025	* S + Deterrence	-0.016
	(0.014)		(0.013)
* S + Deterrence	-0.026	* S + Tax Morale	-0.001
	(0.012)		(0.015)
* S + Tax Morale	-0.026	Solvency score Q5 * Simplified	-0.030
	(0.011)		(0.021)
Age 51-60 * Simplified	0.011	* S + Deterrence	-0.002
	(0.013)		(0.011)
* S + Deterrence	-0.028	* S + Tax Morale	0.012
	(0.010)		(0.011)
* S + Tax Morale	-0.028	Liability Q2 * Simplified	-0.050
	(0.010)		(0.012)
Age 61+ * Simplified	-0.017	* S + Deterrence	-0.005
	(0.013)		(0.010)
* S + Deterrence	-0.024	* S + Tax Morale	0.017
	(0.013)		(0.011)
* S + Tax Morale	-0.016	Liability Q3 * Simplified	-0.042
	(0.008)		(0.010)
One child * Simplified	0.019	* S + Deterrence	-0.019
	(0.013)		(0.007)
* S + Deterrence	0.008	* S + Tax Morale	0.004
	(0.010)		(0.007)
* S + Tax Morale	0.013	Liability Q4 * Simplified	-0.062
	(0.012)		(0.010)
Two or more children * Simplified	0.027	* S + Deterrence	-0.016
	(0.014)		(0.010)
* S + Deterrence	-0.011	* S + Tax Morale	0.016
	(0.012)		(0.010)
* S + Tax Morale	-0.012	Liability Q5 * Simplified	-0.046
	(0.011)		(0.011)
Solvency score Q2 * Simplified	0.059	* S + Deterrence	-0.041
	(0.011)		(0.008)
* S + Deterrence	-0.008	* S + Tax Morale	0.007
	(0.007)		(0.010)
* S + Tax Morale	-0.013		
	(0.005)	N	229,751

Note: The table presents the heterogeneous treatment effects of the TPR FY2015 experiment. Control variables are listed in Table 1. The full set of interactions between individual control and treatment variables are included in the estimation (coefficients not reported). Standard errors in parentheses are clustered by date of letter receipt.

Table A.10: Heterogeneous Effects – Payment Reminders Experiment FY2015

	Probability of payment before enforcement		
Simplified (S)	0.079		
	(0.066)		
+ Deterrence	0.042		(continued)
	(0.047)		
+ Tax Morale	-0.002	Solvency score Q3 * Simplified	-0.018
	(0.058)		(0.013)
Age 31-40 * Simplified	-0.017	* S + Deterrence	-0.021
	(0.013)		(0.013)
* S + Deterrence	0.031	* S + Tax Morale	-0.027
	(0.016)		(0.013)
* S + Tax Morale	0.008	Solvency score Q4 * Simplified	-0.002
	(0.012)		(0.021)
Age 41-50 * Simplified	-0.002	* S + Deterrence	0.001
	(0.013)		(0.010)
* S + Deterrence	-0.015	* S + Tax Morale	0.016
	(0.009)		(0.012)
* S + Tax Morale	0.008	Solvency score Q5 * Simplified	0.109
	(0.013)		(0.011)
Age 51-60 * Simplified	-0.011	* S + Deterrence	0.055
	(0.012)		(0.024)
* S + Deterrence	-0.012	* S + Tax Morale	-0.001
	(0.010)		(0.017)
* S + Tax Morale	0.005	Liability Q2 * Simplified	0.037
	(0.009)		(0.015)
Age 61+ * Simplified	-0.004	* S + Deterrence	0.001
	(0.010)		(0.017)
* S + Deterrence	-0.007	* S + Tax Morale	-0.015
	(0.015)		(0.012)
* S + Tax Morale	-0.006	Liability Q3 * Simplified	-0.021
	(0.013)		(0.008)
One child * Simplified	-0.015	* S + Deterrence	0.047
	(0.020)		(0.013)
* S + Deterrence	-0.007	* S + Tax Morale	0.009
	(0.017)		(0.015)
* S + Tax Morale	-0.014	Liability Q4 * Simplified	-0.009
	(0.019)		(0.009)
Two or more children * Simplified	0.070	* S + Deterrence	-0.009
	(0.010)		(0.009)
* S + Deterrence	-0.033	* S + Tax Morale	0.088
	(0.013)		(0.016)
* S + Tax Morale	-0.008	Liability Q5 * Simplified	0.012
	(0.015)		(0.013)
Solvency score Q2 * Simplified	0.020	* S + Deterrence	0.005
	(0.014)		(0.012)
* S + Deterrence	-0.001	* S + Tax Morale	0.009
	(0.011)		(0.012)
* S + Tax Morale	-0.026		
	(0.010)	N	202,730

Note: The table presents the heterogeneous treatment effects of the TPR FY2015 experiment. Control variables are listed in Table 1. The full set of interactions between individual control and treatment variables are included in the estimation (coefficients not reported). Estimates for Deterrence and Tax Morale joint treatment omitted for brevity. Standard errors in parentheses are clustered by date of letter receipt.

Table A.11: Number of Follow-up Enforcements FY2014

	Nr registered letters within 180 days (1)	Nr garnishments within 180 days (2)	Nr bailiffs within 180 days (3)
Simplified	-0.074	-0.028	-0.012
	(0.003)	(0.002)	(0.002)
Control mean	0.350	0.134	0.078
N	229,751	229,751	229,751

Note: The table presents treatment effect estimates on the number of enforcement actions by type from the payment reminders experiment (TPR FY2014). Control variables are listed in Table 1. Standard errors in parentheses are clustered by date of letter receipt.

Table A.12: RDD: Number of Follow-up Enforcements FY2014

	Nr registered letters within 180 days (1)	Nr garnishments within 180 days (2)	Nr bailiffs within 180 days (3)
Simplified (S)	-0.070	-0.019	0.002
	(0.019)	(0.017)	(0.003)
Enforcement (E)	0.110	0.071	0.000
	(0.025)	(0.026)	(0.006)
S*E	-0.057	-0.032	-0.000
	(0.019)	(0.024)	(0.006)
P-values of tests:			
S+S*E=0	0.000	0.006	0.707
E+S*E=0	0.000	0.000	0.841
Control mean	0.159	0.061	0.002
N	25,855	20,338	30,348

Note: The table presents treatment effect estimates from the regression discontinuity design analysis embedded in the payment reminder experiment (TPR FY2014). Simplified is a dummy variable equal to one for taxpayers who received a simplified letter. Enforcement is a dummy variable equal to one for liability amounts above the cut-off value. Control variables are listed in Table 1. Standard errors in parentheses are clustered by date of letter receipt.

Table A.13: Replication of TPR experiment in FY2015

	Probability of some payment at 14 days (before enforcement)
Simplified (S)	0.107
	(0.004)
+ Deterrence	0.014
	(0.003)
+ Tax Morale	-0.012
	(0.003)
+ Deterrence & Tax Morale	0.006
	(0.003)
P-values of tests:	
Simplified=Control	0.001
S + Deterrence=Simplified	0.001
S + Tax Morale=Simplified	0.007
S + Deterrence + Tax Morale= S + Deterrence	0.011
Control mean	0.418
N	202,730

Note: The table presents results from the FY2015 TPR experiment, which replicated the FY2014 TPR experiment. The sample is the universe of late payers in FY2015. Control variables are listed in Table 1. Standard errors in parentheses are clustered by date of letter receipt. p-values adjusted for multiple hypothesis testing (List et al., 2016).

Table A.14: Repeated Treatment Effects

	Probability of some payment 14 days / follow-up	
	Sample of Taxpayers late in FY2014 (2)	Sample of Taxpayers late in FY2014 and FY2015 (1)
Simplified 2014 (S 2014)	0.001	0.011
	(0.008)	(0.012)
+ Deterrence 2014 (D 2014)	-0.002	-0.010
	(0.007)	(0.010)
+ Tax Morale 2014 (TM 2014)	-0.003	-0.016
	(0.008)	(0.018)
Simplified 2015 (S 2015)	0.025	0.107
	(0.009)	(0.013)
+ Deterrence 2015 (D 2015)	0.001	0.005
	(0.004)	(0.012)
+ Tax Morale 2015 (TM 2015)	-0.004	-0.024
	(0.004)	(0.007)
S 2014 * S 2015	0.005	-0.020
	(0.010)	(0.015)
S 2014 * S + D 2015	-0.002	-0.011
	(0.005)	(0.017)
S 2014 * S + TM 2015	0.004	0.025
	(0.004)	(0.015)
S + D 2014 * S 2015	0.000	0.016
	(0.009)	(0.014)
S + D 2014 * S + D 2015	0.002	0.010
	(0.005)	(0.011)
S + D 2014 * S + TM 2015	-0.002	-0.021
	(0.003)	(0.014)
S + TM 2014 * S 2015	-0.007	0.005
	(0.009)	(0.021)
S + TM 2014 * S + D 2015	0.007	0.027
	(0.005)	(0.011)
S + TM 2014 * S + TM 2015	-0.002	-0.010
	(0.002)	(0.007)
P-values of tests:		
S 2014 = Control	0.824	0.971
S 2015 = Control	0.308	0.001
S 2014 * S 2015 = S 2015	0.823	0.992
S + D 2014 = S 2014	0.947	0.945
S + D 2015 = S 2015	0.907	0.996
S + D 2014 * S + D 2015 = S 2014 * S + D 2015	0.986	0.582
S + TM 2014 = S 2014	0.976	0.751
S + TM 2015 = S 2015	0.993	0.948
S + TM 2014 * S + TM 2015 = S 2014 * S + TM 2015	0.165	0.959
Control mean	0.825	0.410
N	229,751	66,705

 Note: The table present treatment effect estimates for repeated treatment in the payment reminders experiment. Sample size is limited to individuals who were late with payment in both FY2014 and FY2015. For FY2015 treatment assignment both dummies for Deterrence and Tax Morale equal one for individuals who received a letter with both a deterrence and tax morale message. Control variables are listed in Table 1. Standard errors in parentheses are clustered by date of letter receipt. p-values adjusted for multiple hypothesis testing (List et al., 2016).

Letter A.1: Tax Payment Experiment - Old Letter

Federal Public

Service

FINANCE

Sent from: Recovery Team Leuven 2
Philipssite 3a PO Box 2 3001 Heverlee

General Tax Administration

Rep. N°:
Page 1/5

Personal income tax and additional taxes – Taxation 2016[2]

Dear Madam, Sir,

This is the **notice of assessment** regarding your personal income tax and additional taxes. Please find below the **tax amount to be paid.**

Income year 2015	Tax assessment year 2016	Tax Identification Number	Municipality MEISE
Date of enforcement tax roll 08/07/2017	Date of sending 10/07/2017		National Number

Amount to be paid:

- at the latest on **08/09/2017**
- on bank account number:
- mentioning the structured communication:

(BIC:)

€ 924.86

In the case of late or non-payment, default interest will be due (7% on annual basis) and costs of proceedings may be charged.

Additional information:

Please keep this tax assessment notice carefully. You may need it to prove your income.
Please also read the important information at the back of this letter.

²:Pursuant to Article 136 of the Belgian Royal Decree enforcing the Income Tax Code 1992.

This tax assessment notice has been sent by Zoomit; it is linked to the account number

Do you have any questions about your tax assessment notice?

1) General information
Go to www.finance.belgium.be. Under 'Private Individuals' > 'Tax Return' you will find information about:
- payment and refund of tax
- advance payments and bonuses

2) Simple questions
Call the **Contact Center** at **+32 257 257 57** (standard rate) for simple questions: each working day from 8.00 to 17.00. Or ask your questions by means of the contact form (www.finance.belgium.be > Contact).

3) Specific questions

Calculation of the tax	Payment of the tax	Filing an objection
Your tax office Individuals LEUVEN • MANAGEMENT TEAM 1	Your team Recovery Private Leuven 2	Your Center Private Individuals LEUVEN
Philipssite 3A PO Box 1 3001 Leuven Tel. +32 257 381 90 p.leuven.team1@minfin.fed.be	Philipssite 3a PO Box 2 3001 Heverlee. Tel. +32 257 384 10 teaminv.leuven2@minfin.fed.be	Philipssite 3A PO Box 1 3001 Leuven Tel. +32 257 507 80

Our offices are open from 9.00 to 12.00 or by appointment.

Mention the Tax Identification Number and your National Number at every contact with our offices (you can find them on the recto side)

What to do if you object to the tax assessment?

- **In the case of simple errors and mistakes**
  - o   Please contact your tax office as soon as possible using the contact details above.
  - o   If you do not receive an adequate answer before the expiry of the legal objection period (i.e. within six months as from 10/07/2017), it is recommended to file an objection.
- In the case of **fundamental disputes**, it is recommended to always file an **objection.**

How to file an objection?
- On myminfin.be, or
- By post: send a motivated objection:
  - clearly stating the reasons why you object to the assessment
  - written, dated and signed by you and by the spouse on whose goods the assessment is being recovered, or by a mandatory (add a proxy to allow him/her to act in your name)
  - within a period of six months as from 10/07/2017 under penalty of cancellation
  - to Private Individuals Leuven
  - and carrying the following information:
    - o   name, address and National Number of your spouse and yourself
    - o   if the objection is filed by a mandatory: name, address and capacity of your mandatory
    - o   the type of tax (personal income tax and additional taxes)
    - o   the Tax Identification Number (   )
    - o   the municipality (MEISE)
    - o   the tax assessment year (2016)
    - o   the Recovery Team (Leuven 2)
    - o   the tax office (PRIVATE INDIVIDUALS LEUVEN – MANAGEMENT TEAM 1)

You can be heard provided explicit request in your objection.
During the objection procedure you can request a mediation with the **Tax Mediation Department**, Koning Albert II-laan 33, PO box 46, 1030 Brussels: fax +32 257 980 57 - fiscaal.bemiddelaars@minfin.fed.be - www.fiscalebemiddeling.be

- In a limited number of cases, you can still request an **official rectification** of your assessment **after the expiry of the objection period.** File the request within five years as from the 1st of January of the year in which the tax has been established or as from the 1st of January of the assessment year to which the tax is related. Please contact your tax office as soon as possible using the contact details above.
- If you believe that the same income has been **unduly taxed in two different countries**, you can file a request for mutual agreement in your country of tax residence. Submit your request to **International Relations,** Commentary Department, North Galaxy, Koning Albert II-laan, 33 PO Box 22, 1030 Brussels – aagfisc.internat.com@minfin.fed.be.

Why do you have to keep the tax assessment notice?

The tax assessment notice proves the amount of **your income.** You may need the tax assessment notice and its enclosures to prove your income level if you think you are entitled to **social benefits** (scholarships, social loans, housing bonuses, increased health care reimbursements in the case of 'Omnio' eligibility or eligibility for increased reimbursement etc.).
It is also possible to **print them from MyMinfin.be.**

The transfer order may be handwritten. In such case, please mention one CAPITAL LETTER or number in black (or blue) ink in each box.

TRANSFER ORDER

03

Account principal (IBAN)

Name and address principal
MR xx
Street yy
Zz City

Account beneficiary (IBAN)   B   E 12345678901234

BIC beneficiary   P   C   H   Q   R   F   R   B

Name and address
TEAM BUZONDERE INV GENT
GASTON CROMMENLAAN 6 B202
9050GENT

Message   + + 333   /   2222   /   11111 +   + +

9 2 4   8 6
CENT

signature(s)

T

Letter A.2: Tax Payment Experiment - Simplified Letter

DD/MM/YYYY

Federal
Public Service
FINANCE

General Tax Administration

Sent from Mention name and address of your service

National Number:	Tax Identification Number:	Date of enforcement	Municipality:
xx.xx.xx.xxx-xx	xxxxxxxxxx	tax roll	Evergem
xx.xx.xx.xxx-xx		xx/xx/xxxx	

Dear Mr xx,
Dear Mrs yy,

This is the notice of assessment[1] regarding your personal income tax and additional taxes on your income of 2016 (tax assessment year 2017). Please find below the tax amount to be paid.

Amount to be paid: (see details below)

1,254 euro

- On bank account number BEXX XXXX XXXX XXXX
- Mentioning the following structured communication: +++111/2222/33333+++
- At the latest by 15/03/2016

Important remark: in the case of late payment, we will take actions in order to recover this debt. Default interest (7%) and costs will be charged to you.

In the case of payment difficulties, it is possible to apply for an instalment plan on MyMinfin.be

Please keep this tax assessment notice carefully. You may need it to prove your income, e.g. to apply for social benefits (scholarships, social loans, housing bonuses, increased health care reimbursements etc.).

It is always possible to print it from MyMinfin.be.

[1] Pursuant to Article 136 of the Belgian Royal Decree enforcing the Income Tax Code 1992.

TRANSFER ORDER

The transfer order may be handwritten. In such case, please mention one CAPITAL LETTER or number in black (or blue) ink in each box

Account principal (IBAN)

Name and address principal
MR xx
Street yy
Zz City

Account beneficiary (IBAN)
B E 1234567890 1234

BIC beneficiary
P

Name and address
TEAM BIJZONDERE INV GENT
GASTON CROMMENLAAN 6 B202
9050 GENT

Message
+

03

1254

GENT 1254 000

Do you have any questions?

General information	Payment	Calculation
- finance.belgium.be Information: > Private individuals > Tax return Contact form: > Contact - Contact Center: 0257 257 57 Each working day from 8,00 to 17,00 (standard rate)	Your team Recovery Gent 1 Gartenstraat 48 9050 Gent (Belgium) Tel. 0257 564 30 dienst@minfin.fed.be	Your tax office Team P Management Gent 1 Gaston Crommenlaan 6/404 9050 Gent (Belgium) Tel. xxxxxxxxxx dienst@minfin.fed.be

Our offices are open from 9,00 to 12,00 or by appointment.

Indicate the Tax Identification Number (xxxxxxxxxx) and your National Number (xx.xx.xx.xxx-xx) in every contact

What to do if you object to this tax assessment notice?

- In the case of simple errors and mistakes
  → Please contact your tax office as soon as possible using the contact details above.

- In the case of fundamental disputes it is recommended to file an objection.
  How can you file an objection? (for more information: tel. 0257 923 40)

  File an objection within six months[1]:
  - either on MyMinfin.be
  - or by letter: send a motivated objection to:
    [Centrum Particulieren GENT] – [Gaston Crommenlaan 6/404 9050 Gent]
    - clearly stating the reasons why you object to the assessment
    - written, dated and signed by you and by the spouse on whose goods the assessment is being recovered, or by a mandatory (add a proxy to allow him/her to act in your name)
    - and carrying the following information:
      - name, address and National Number of your spouse and yourself
      - If the objection is filed by a mandatory: name, address and capacity of your mandatory
      - Tax Identification Number (xxxxxxxxxx), municipality (EVERGEM)

  You can be heard provided explicit request in your objection.

  During the objection procedure you can request a mediation with the Tax Mediation Department, Koning Albert II-laan 33, PO Box 46, 1030 Brussels. fiscaal.bemiddelaars@minfin.fed.be • www.fiscalebemiddeling.be

- In a limited number of cases, you can still request an official rectification of your assessment after the expiry of the objection period. The request has to be made within a period of five years[2]. Please contact your tax office as soon as possible using the contact details above. In this case as well you can appeal to the Tax Mediation Department (see above).

[1] To be calculated from the third working day which follows [date of sending], or in the case of an electronic mail, from the day the tax assessment notice has been made available.
[2] To be calculated as from the 1st of January of the year in which the tax has been established or as from the 1st of January of the assessment year to which the tax is related.

Letter A.3: Payment Reminder Experiment - Old Letter

Federal

Public Service

FINANCE

TAX COLLECTION AND RECOVERY

Tel.: +32 257 567 20
IBAN: BE66679200241443
BIC: PCHQBEBB

Sent from: TEAM INV NP HALLE
ZUSTER BERNARDASTRAAT 32 1500 HALLE

MR xx
Street yy
Zz City

OUR REFERENCE: Article 111.222.333
Municipality: BEERSEL
PAYMENTS MADE UNTIL 8.11.2016 HAVE BEEN TAKEN INTO ACCOUNT
PERSONAL INCOME TAX ASSESSMENT YEAR 2016

Dear Madam,
Dear Sir,

According to my information, the assessment referred to above remains unpaid for the following amounts:

Taxes due:	4,992.80
Costs due:	5.70
Interests due:	114.80
Amount already paid (taxes + costs + interests):	- 157.50
Balance to be paid:	EUR 4,885.80

I request you to settle this balance immediately. If you fail to make **an immediate payment by means of the transfer order below**, I will take legal actions in order to recover this debt. This will entail additional costs, which you shall bear.

INTEREST RATE UNTIL 31.12.98 = 9,6%, AS FROM 01.01.99 = 7%

More information can be found on the reverse.

Yours faithfully,

The tax collector

USEFUL INFORMATION

1. IF YOU HAVE ALREADY PAID, please contact my office and send me the proof of payment or a copy of that proof.

2. DO NOT WAIT UNTIL THE LAST DAY TO SETTLE THE PAYMENT! Some working days lapse between the order to pay and the execution of the payment.

3. IF YOU CONSIDER MODIFYING THE AMOUNT OR IF YOU WISH TO PAY IN ANOTHER MANNER THAN BY MEANS OF THIS TRANSFER FORM, you must copy the NOTIFICATION OF PAYMENT correctly from the payment form that is attached.

4. LEGAL MEANS OF RECOVERY
In the absence of voluntary payment, the Tax Collector has the possibility to seize your wage and property and, if necessary, to sell that property.

5. In the event that this assessment is disputed, you are only required to make the immediate payment of the amount that is communicated:
   - either by the tax assessor entrusted with the rectification of the error made;
   - or by the official entrusted with the examination of your notice of objection (form 178 J). In the latter case, the Tax Collector may take precautionary measures (mortgage, protective seizure, etc.) in order to guarantee the payment of the balance (costs and interests included).

TRANSFER ORDER

03

The transfer order may be handwritten. In such case, please mention one CAPITAL

* 4 8 5 8 0 CENT

Account principal (IBAN)

Name and address principal
MR xx
Street yy
Zz City

Account beneficiary (IBAN): B E 1234567890 1234

BIC beneficiary: P

Name and address
TEAM BIJZONDERE INV GENT
GASTON CROMMENLAAN 6 B202
9050 GENT

Message: +

Letter A.4: Payment Reminder Experiment - Simplified Letter

16.11.2016

Federal
Public Service
FINANCE

General Administration of Tax Collection and Recovery

More information can be obtained from:
Tel. +32 257 925 60
E-mail: tbigent@minfin.fed.be
Opening hours: as from 9 am to 12 pm
or by appointment

Sent from: TEAM BIJZONDERE INV GENT
GASTON CROMMENLAAN 6 B202 BE-9050 GENT

MR xx
Street yy
Zz City

Name	xx yy
National number	**83.05.21.301-71**
Tax type	PIT
Assessment year	2015
Article of the assessment book	111.222.333

Calculation

Established taxes	4,922.80
Costs	5.70
Interests	114.80
Amount already paid* (taxes + costs + interests)	- 157.50
Balance to be paid	**€ 4,885.80**

* Payments made until 8.11.2016 were taken into account

The interests for late payment will be calculated each month, at an annual interest rate of 7%. More information can be found on our website **www.financien.belgium.be** by entering the search term 'payment'.

If you lodged an objection, please contact us by e-mail (tbigent@minfin.fed.be) or by telephone (+32 257 925 60).
More information can be found on our website **www.financien.belgium.be** by entering the search term 'objection'.

Your file number: 111.222.333 – 83.05.21.301-71

Dear Mr xx yy,

You have an outstanding tax debt (see reverse).

Please pay the amount of **4,885.80 Euro within 48 hours** by transfer into the account number **BE50 6792 0023 8918**, mentioning the structured communication **+++066/5689/39627+++**.

If you fail to make a payment, we will take actions in order to recover this debt. You will bear the interests for late payment and the costs.

We thank you if in the meantime you have already made a payment.

Yours sincerely,

The recovery advisor - tax collector

TRANSFER ORDER

The transfer order may be handwritten. In such case, please mention one CAPITAL

Account principal (IBAN)

Name and address principal

MR xx
Street yy
Zz City

Account beneficiary (IBAN)   B E 12345678901234

BIC beneficiary   P C H O R E B B

Name and address   TEAM BIJZONDERE INV GENT
GASTON CROMMENLAAN 6 B202
9050GENT

Message   + + 333 / 2222 / 11111 +

(signature(s))

03

CENT
* 4 8 8 5 , 8 0
T

Letter A.5: Filing Reminder Experiment - Old Letter

Federal
Public Service
FINANCE

General Tax Administration
Fiscaliteit

Sent from : *Please mention the name of your service*

your message of	your reference	our reference	enclosure(s)

Reminder: Did you forget to submit your personal income tax return for tax year 2016 (income of 2015)?

Dear Madam, Sir,

On 01.09.2016, we had **not yet received** your personal income tax return for tax year 2016 (income of 2015). De deadline for the submission in time was 30.06.2016.

Not submitting a return in time is an infringement. You will find the sanctions you may be faced with on the overleaf of this letter.

You can still avoid these sanctions by **submitting your return within a fortnight** as from the sending of this letter. You will find further instructions on the overleaf of this letter.

However, your submission remains late. This reminder does not change the initial legal submission deadline. If serious reasons or circumstances have prevented you from submitting your return before 30.06.2016, you should notify your tax office in writing.

You should not reply to this letter if:
- you have already submitted your return in the meantime,
- you have been granted a valid extension to submit your return beyond 01.09.2016,
- you have ordered your mandatory to submit your return. Your mandatory may still submit your return until 29.10.2016.

Yours faithfully,

Head of Department

How can you still make your submission?

Two possibilities:

- via **www.taxonweb.be**
  You will need an electronic identity card and a card reader or a token (for each partner in case of a common return).

- by sending your return form to:

  Scanningcentrum
  Gaston Crommenlaan 6 (Zuiderpoort) bus 1 tot 3
  9050 Ledeberg)

The return form shall be dated and signed (by both partners in case of a common return).
If you have not received the return form, or in case you have lost it, you can request a new form at your tax office:

AdminName1 – Phone – Email

Which sanctions may you be faced with?

If you should not submit your personal income tax return in time, the FPS Finance may:

- apply **administrative sanctions** such as:

  - an administrative fine of 50 to 1,250 euros (Article 445, ITC 92)
  - a tax increase of 10% to 200% (Article 444, ITC 92)

- impose the tax over an **assessment period of 3 years** (Article354,1°, ITC 92)

- apply the **official assessment procedure** (Article 351, ITC 92)

- apply the **minimum of taxable profit or gains** for companies and independent professionals (Article 342 §3, ITC 92).

Do you have further questions?

Additional information concerning your file can be obtained from your tax office:

AdminName1 – Phone – Email

**Federal
Public Service
FINANCE**

Sent from : *Please mention the name of your service*

General Tax Administration

Mr. JAN PEETERS
Mrs PETRA JANSENS
KERKSTRAAT 1
1000 BRUSSELS (Belgium)

your letter of	your reference	our reference	enclosure(s)

Dear Mrs Jansens,
Mr Peeters,

We have not yet received your personal income tax return for tax year 2016 (income of 2015).
Nevertheless, you should have submitted your return by 30.06.2016 at the latest.

Submission of your return within 14 days

If you fail to do so, you may be faced with **a fine and an tax increase**.

How can you make your submission?

- via **taxonweb.be**, or
- by sending your **paper return form** to:
  Scanningcentrum
  Gaston Crommenlaan 6 (Zuiderpoort) bus 1 tot 3
  9050 Ledeberg
  The return form shall be dated and signed (by both partners in case of a common return).

You should not reply to this letter if:

- you have already submitted your return in the meantime.
- you have been granted a valid extension to submit your return.
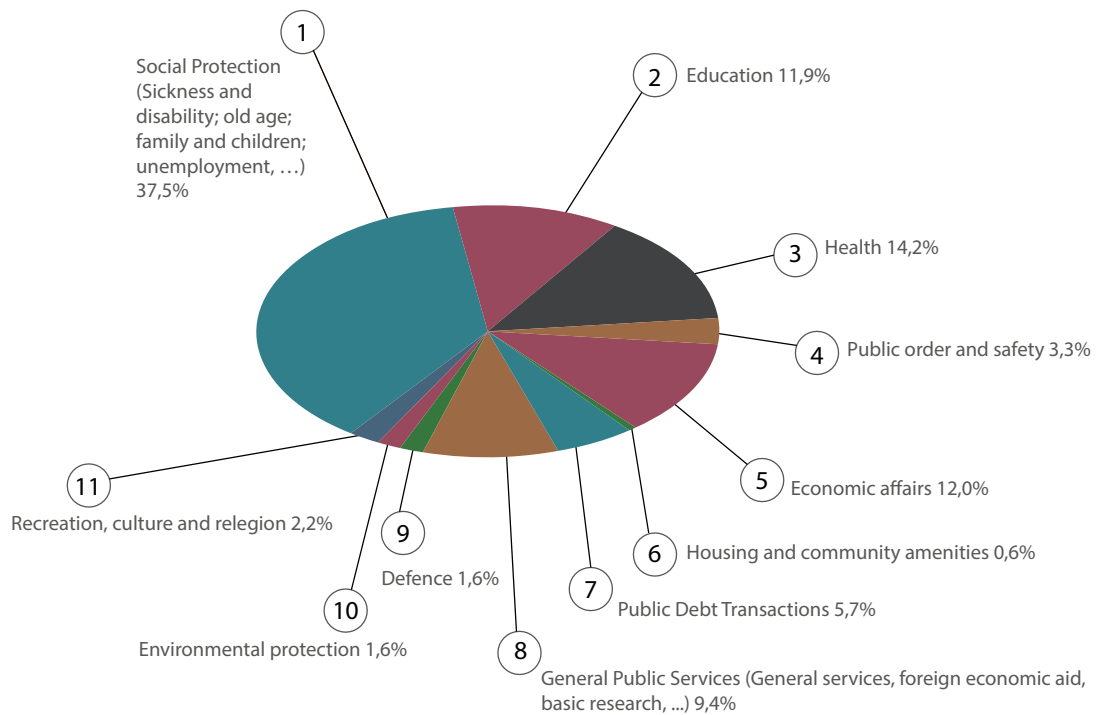- you have ordered your mandatory to submit your return.

Further questions?
AdminName1 – Phone – Email

Yours sincerely,

Head of Department

How are your taxes and social contributions spent?

1 — Social Protection (Sickness and disability; old age; family and children; unemployment, …) 37,5%

2 — Education 11,9%

3 — Health 14,2%

4 — Public order and safety 3,3%

5 — Economic affairs 12,0%

6 — Housing and community amenities 0,6%

7 — Public Debt Transactions 5,7%

8 — General Public Services (General services, foreign economic aid, basic research, ...) 9,4%

9 — Defence 1,6%

10 — Environmental protection 1,6%

11 — Recreation, culture and relegion 2,2%

Letter A.8: Online Filers Survey

The answers to the following 10 questions are treated independently on an anonymous basis and are not linked to individual declarations.

1. On a scale of 1 to 10, to what extent do you find it easy to submit your tax return via Tax-on-Web?

2. On a scale of 1 to 10, how satisfied are you with the content and functions of Tax-On-Web?

3. On a scale of 1 to 10, how would you recommend Tax-On-Web to friend (s) or colleague (s)?

4. On a scale of 1 to 10, to what extent are you satisfied with the general tax system?

5. On a scale of 1 to 10, to what extent do you value the public services where (your) tax money is used for?

6. On a scale of 1 to 10, to what extent do you agree with the way your tax money is currently being spent?

7. On a scale of 1 to 10, to what extent do you think citizens should be completely honest when completing their tax return?

8. On a scale of 1 to 10, to what extent do you have a good idea of where your tax money goes?

9. Please add the following budget categories with the percentage of tax payable to you to these public services (total = 100%):

    - General government management (public debt, public services, basic research, foreign economic assistance, etc.)
    - Defence
    - Public order and safety
    - Economics
    - Environmental protection
    - Housing and common facilities
    - Recreation, culture and religion
    - Education
    - Health
    - Social protection (elderly, sickness and disability, family and children, unemployment, ...)

10. If you had the opportunity to give your preference in terms of budget priorities, in which order would you spend the following categories on your tax money? Please place numbers from 1 (highest priority) to 10 (lowest priority) next to the following categories: (same as above)