APPLYING BEHAVIORAL INSIGHTS TO TAX COMPLIANCE: EXPERIMENTAL EVIDENCE FROM LATVIA[1]

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Abstract

In recent years, tax authorities around the world have started to use behavioral insights to encourage taxpayers to fulfill their obligations. We review and discuss some of the recent empirical literature on tax compliance. In line with recent trends, we report on a field experiment in collaboration with the State Revenue Service of Latvia (SRS) to encourage previously non-compliant individuals, who also have their own business income, to submit their tax declarations on time in 2017. These individuals were pre-emptively sent emails with behaviorally informed messages in order to reach and influence an important target population at a salient moment. Our results indicate that all of the behaviorally-informed messages increased submissions by the submission deadline when compared to a control group. The best performer was a message that specifically framed non-compliant behavior as a deliberate choice and increased timely submissions by 9.4% (4.1 percentage points; $p=0.05$).

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1. INTRODUCTION

In recent years, behavioral economics, the practice of melding psychological and analogous insights within standard economic models, has been applied in a wide variety of policy arenas. An overlap in interest between governments, who are often attracted by the idea of relatively low-cost interventions, and researchers, who have been inspired by encouraging results from increasingly ambitious field experiments, has led to a growing body of empirical evidence, and to the establishment of national and sub-national "nudge" units. One context that has proven particularly fruitful from both perspectives is tax compliance which has, in turn, received substantial attention and resulted in a number of successes.

Recent studies have explored a wide variety of psychological tactics to increase tax compliance. These have either included deterrence messages aimed at addressing misperceptions of the various parameters of the classic incentive-based model of Allingham and Sandmo (1972), or have included notions of benefits from taxation, fairness and social norms, morality, and other topics, sometimes broadly classified as "tax morale" (Luttmer & Singhal, 2014), or addressed using the term "moral suasion" (Mascagni, 2018; Torgler, 2004b), and often described as targeting non-pecuniary and intrinsic motivations.

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However, the results from these studies have been mixed, highlighting the centrality of the interaction between messages and specific environments, including the baseline characteristics and perceptions of taxpayers, and the type of tax (e.g., individual or business tax, income, or other). In this paper, we first present a short review of the increasing body of evidence from tax compliance experiments to take stock of the most recent literature and findings. We organize the literature first by the different types of messages used, which are broadly classified as deterrence and non-deterrence messages. We subsequently mention other types of behaviorally informed interventions, such as rewards and other incentives, varying communications channels, and more. We highlight sources of heterogeneity wherever relevant, including the type of tax in question, target groups, timing of interventions, communication channels, and outcomes. We find that, overall, deterrence messages that change the perceived probability of audit or make the penalties for non-compliance salient worked in a number of different field experiments, although there were some exceptions. When considering other types of messages, we find that messages highlighting the tax behavior of others (i.e., social norms) and omission/commission messages that increase the moral costs of non-compliance have worked towards increasing compliance for income taxes.

Next, we study tax compliance behavior in a country where tax revenue is substantially subverted by the presence of a large shadow economy, namely Latvia. The shadow economy in Latvia is estimated to be close to a quarter of the official gross domestic product (GDP) level, compared with an Organisation for Economic Co-operation and Development (OECD) average of only 14 percent. This includes both underreported wages from formal employment and underreported income from individuals who are self-employed.

We present results from an experiment in conjunction with the tax authority in Latvia, where behaviorally-informed messages were sent to self-employed individuals who had failed to submit their tax declaration or had submitted it late in any of the previous three years. We show that, in the Latvian context, an omission/commission message framing non-compliant behavior as a deliberate choice improved subsequent compliance by 9.4% (4.1 percentage points; $p=0.05$) more than a social norms message for tax declarations and showed a significant improvement when compared to the control group. With regards to late compliance, the social norms message had generated the most tax declaration submissions a month and a half after the deadline, 5.1% more (or 3.2 percentage points) than the control group. Both of these impacts become stronger when we introduced controls for other important drivers of compliance, such as demographics, and past income and tax payment behavior. We found that a third simple reminder message had no impact.

We expect the paper to be useful in several ways. First, it incorporates a brief and up-to-date summary of the large number of behaviorally-informed tax compliance interventions completed. Second, the paper presents the results of a pre-emptive intervention experiment targeted at a group of individuals central to the shadow economies of Eastern Europe: partially or fully self-employed individuals who have previously delayed in declaring or failed to declare tax obligations. As such, our paper also increases understanding about how to reduce shadow economies. Furthermore, to the best of our knowledge, no previous behavioral tax compliance interventions of any kind have been carried out in Latvia (or any highly similar country in the same geographical area and with a large shadow economy). Third, we add evidence in respect of several of the most consistently promising types of behavioral messages used in previous field experiments by directly comparing their relative efficacies.

The paper is organized as follows. Section 2 discusses the current literature on behavioral interventions related to tax compliance. Section 3 introduces the context of our experiment, including the collaboration with Latvian tax authorities, and the experiment's formal design and data. Section 4 presents the main results and Section 5 concludes.

2. A SHORT REVIEW OF THE BEHAVIORAL TAX LITERATURE

Recently, researchers have started working alongside tax authorities to test different insights drawn from behavioral science through randomized control trials and other quasi impact evaluation methods at scale (Pomeranz & Vila-Belda, 2018). While, traditionally, most of this work has been in higher income countries, new studies and evidence are emerging from middle and lower income countries. According to Hallsworth (2014), the number of field experiments in taxation doubled between 2012 and 2014.

Recent trials have both exhaustively tested the parameters and predictions of the traditional deterrence model and explored several different components that comprise "tax morale" in an attempt to explain the high levels of compliance observed in practice. Recent experiments have also become more ambitious in scale, trying to reach as many taxpayers as possible. The tax system in the country, the type of tax in question, the underlying characteristics and perceptions of taxpayers, social and cultural attitudes, and the baseline behaviors of taxpayers all appear to be relevant sources of heterogeneity. In particular, a lot of the literature finds that individuals with different levels and sources of income, and firms, act differently. While most experiments target delinquent taxpayers who have missed payment deadlines, some target those who have forgotten to declare their tax obligations in the first place. Outcomes therefore typically include reported income, payments made, and payment amounts within a certain time frame after the intervention. The experiments reported below were also cost-effective, primarily using letters but also using emails and text messages to communicate messages and administrative data to both target individuals and firms, and to measure outcomes.

At least three recent review papers (Hallsworth, 2014; Mascagni, 2018; Slemrod, 2017) are excellent sources that survey and interpret a lot of the recent experimental tax literature in depth[5]. These reviews are also wide in scope, discussing the broader tax literature and examining some of the experiments in great detail. Pomeranz and Vila-Belda (2018) also include an updated review of the tax literature in the context of recent collaborations between tax authorities and researchers. Hashimzade et al. (2013) is an excellent source for the theoretical background of the tax compliance literature. Arcos Holzinger and Biddle (2016) include an in-depth discussion of the theory, evidence, and related psychological insights. In this review, we attempt to arrange the evidence, focusing primarily on the psychological insights that were used to design the interventions, and cite an updated list of related field experiments. Using this method of categorization helps to put the focus squarely on the underlying beliefs, perceptions, and norms that, if changed, may subsequently result in a change in tax compliance behavior. We broadly divide the messages used in interventions into deterrence and non-deterrence categories, before discussing other kinds of behaviorally informed interventions. There are two important caveats: first, we do not claim that this review is comprehensive, and second, we do not comment on the size of the impacts. Therefore, this is a much shorter, more focused, and more abbreviated review of the important recent literature on behavioral insights towards improving tax compliance.

[5] Hallsworth (2014) also contains an excellent and easy to follow summary table of the major field experiments and results.

2.1 Deterrence Messages

2.1.A Perceptions of audit probability

Because individuals tend to overweight low probabilities, interventions that inform taxpayers about the true probability of an audit can be effective, even when this is quite low (Kahneman & Tversky, 1979). However, creating an ambiguous audit environment with unknown or irregular audit probabilities may also be effective at increasing compliance (Dai et al., 2015). Recent field experiments have extensively tested how changing these perceptions and making them more salient can affect tax compliance. In general, messages that increase the perception of audit probability appear to be effective. However, compliance does not typically increase with increasing probability, and there is a risk of heterogenous effects with poorer compliance for higher income individuals and firms in some cases.

For example, Slemrod et al. (2001) find that, in the U.S., increased perceptions of audit increased reported income for lower and middle income taxpayers who, in general, had greater opportunities to evade on self-reported income, rents, and royalties. Hasseldine et al. (2007) show that deterrence letters improved compliance for sole proprietors in the U.K. who had reported income below a certain threshold for two consecutive years and, in particular, for those submitting self-prepared returns. Kleven et al. (2011) show that, in Denmark, income tax compliance differed based on the individual's past audit experience and increased with increasing probability of audit. For example, the treatment group that was to be audited with certainty had significantly larger effects (almost double) than the treatment group with a 50% audit probability. They also show that options to evade matter, with compliance at almost 100% with the presence of third-party reporting but lower for those who self-reported income. In Finland, high and low probability audit letters sent to small, labor-intensive businesses increased VAT reporting for the high probability group (Harju et al., 2014). Similarly, other studies (including Dwenger et al., 2016, which examined a local church tax in Germany) find that making the probability of audit salient increases compliance, although compliance does not increase with increasing audit probability. In a large scale experiment in Uruguay, Bérgolo et al. (2017) found that providing firms with detailed information about past audit statistics, and average audit probability and penalties, together with a letter stating that evasion increases chances of audit, increased compliance, with the latter treatment performing marginally better. However, they not only found that higher audit probabilities (or penalties) do not lead to higher payments, but that firms' beliefs of audit probabilities drop after receiving the treatment letters. The authors hypothesize that even though firms respond to the threat of audit, it is not through the rational mechanisms laid out in Allingham and Sandmo (1972).

Along with the differential effects outlined above, the evidence also suggests that being able to implement the stated probabilities of audit (compared to nudged perceptions) may be important (Carrillo, Pomeranz, et al., 2017; Mascagni, 2018). Deterrence messages may also backfire in some cases, leading to a reduction in compliance levels. In some cases, compliance or reported income fell for high income individuals and firms (Ariel, 2012; Gangl et al., 2014; Slemrod et al., 2001). For example, in Gangl et al. (2014), the authors hypothesize that the reduction in compliance for firms in Austria is due to the crowding out of taxpayers' intrinsic motivation to comply.

2.1.B Perceptions of tax evasion costs

Research has shown that individuals may underestimate and/or be inattentive to financial penalties (Karlan et al., 2016; Stango & Zinman, 2011). Thus, vividly highlighting the financial, temporal, and effort costs of being caught seems to be an effective way of increasing tax compliance (see the lab experiments in Blackwell, 2007). Recent field experiments that have made penalties salient have also shown promising results in terms of increasing compliance.

For example, in a large scale field experiment in Argentina, a deterrence letter relating to property taxes that provided a simple example of the different costs that would arise from unpaid taxes after a year increased compliance (Castro and Scartascini, 2015). Perez-Truglia and Troiano (2018) made salient penalties to delinquent individuals in the U.S., resulting in an increase in payments.

2.1.C Other deterrence messages

A third parameter affecting compliance in Allingham and Sandmo (1972) is the tax rate. Harju et al. (2014) studied the impact of exogenously varying the VAT rate and found that a higher tax rate led to lower compliance rates for hairdressers in Finland.

Another way of reframing audit probabilities that has proven to be relatively successful is to make detection by authorities more salient. Oftentimes, this information is obtained from third-party reporting (see Pomeranz and Vila-Belda, 2018, for further details). For example, Fellner et al. (2013) carried out a field experiment in Austria with potential TV license fee evaders. They found that employing a letter treatment emphasizing that the risk of detection was high, and highlighting the associated financial and legal penalties involved had a strong effect on compliance. In an experiment conducted in Norway which aimed to increase reporting by individuals on foreign income, the addition of a sentence noting that the tax administration had detected assets abroad in previous years to communications led to more individuals reporting foreign income (Bott et al., 2017). Similarly, a letter sent to firms in Chile notifying them that they were being monitored and may be audited led to increased VAT payments (Pomeranz, 2015). In an experiment with delinquent firms in Costa Rica, Brockmeyer et al. (2016) found that a set of deterrence messages, including the threat of detection as a result of third-party information, had strong effects on compliance.

2.2 Non-Deterrence Messages

2.2.A Perceptions of public benefits from compliance

Utilizing a set of messages that highlight the benefits of compliance (i.e., how taxes are used and how this benefits society) may increase tax compliance. The simple idea behind such fiscal exchange literature is that citizens can be motivated to pay revenue (taxes) for the services provided by government. This can happen through a variety of means: intrinsically motivating taxpayers to reciprocate because they appreciate the services provided; increasing the moral costs of non-compliance; invoking feelings of empowerment or agency when individuals can allocate expenditure; and improving transparency and trust in order to improve taxpayers' relationships with the state. Overall, utilizing these types of messages has produced mixed results.

For a successful example, see Bott et al. (2017), which details a field experiment in Norway where there was increased reporting of foreign income by individuals when the letter they received highlighted that taxes are used for publicly financed services. Similarly, Hallsworth (2014) found that messages with both positive and negative framing of gains and losses, respectively, from (not) funding public services in the U.K. increased compliance. An experiment in Argentina showed that the impact of the actual provision of a public good, a sidewalk by a municipality, had persistent effects on compliance for winners (randomly chosen from those who complied) along with spillover effects on neighbors (Carrillo, Castro et al., 2017). In the Rwandan context, Mascagni, Nell and Monkam (2017) found that a public service message (delivered via SMS, and emphasizing how taxes help to provide education, healthcare, and safety for citizens) was the most effective at improving compliance, even in a low income setting.

However, there are also several instances where such messages have been less effective. For example, Castro and Scartascini (2015) found no effect in the context of property taxes in Argentina when utilizing a letter that provided information on the use of revenues by the municipality. Blumenthal et al. (2001) studied the impact of letters to taxpayers that both highlighted how taxes in Minnesota (U.S.) are spent and encouraged support for these services, and found that they had no effect on compliance. Bérgolo et al. (2017) also found that a public goods message in a letter sent to firms in Uruguay had no effect on compliance. In addition, Torgler (2004b) found that letters sent in Switzerland that explained the role that taxes and compliance play in maintaining active citizen participation and democratic structures had no effect on compliance rates. Ariel (2012) found that when firms were given information about how public money is spent and the social implications of non-compliance, it actually reduced compliance rates.

Can enabling taxpayers to play a more active role in the process (for example, by allowing them to specify their spending priorities) increase compliance rates? In a hypothetical lab setting in the U.S, Lamberton et al. (2014) found that compliance increased when taxpayers were given increased agency and provided with a feedback channel. An earlier lab study in Costa Rica and Switzerland (Torgler, 2004a) produced similar findings, but no field experiment evidence currently exists.

2.2.B Perceptions of government

Perceptions of, or attitudes towards, the effectiveness of government itself can influence compliance. While most studies here are descriptive, we still think it is important to take this into consideration when thinking about compliance.

Frey and Torgler (2007) showed that perceptions of tax evasion, along with institutional measures (such as voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rules of law, and control of corruption) are correlated with tax morale. In a comparative study in Botswana and South Africa, Cummings et al. (2009) found that perceptions of the quality of governance, perceived through fairness of the tax administration, fiscal exchange, and overall attitudes may explain compliance. In an interesting modification, Kettle et al. (2016) found that invoking national pride increases compliance in Guatemala. Besley et al. (2015) showed how an unpopular and "unfair" tax in the U.K. had persistent effects on compliance long after its removal, making a key empirical contribution to the theoretical literature on fairness and compliance (see, for example, the discussion of distributive, procedural, and retributive justice in Kirchler, 2007).

2.2.C Social norms

Previous studies have shown that people are "conditional cooperators" in the lab, increasing their contributions in public goods games if others are also contributing, but withdrawing otherwise (Charness & Rabin, 2002; Fehr & Falk, 2002). Several studies have shown that these preferences also hold true in the domain of tax compliance, in that any individual taxpayer will be less inclined to pay her taxes if she believes that others are not cooperating—that is, if she believes that others are not paying their fair share of taxes (Bazart & Bonein, 2014; Frey & Torgler, 2007). Therefore, what others do (descriptive expectations) and believe (injunctive or normative expectations) affect an individual's behavior (Bicchieri et al., 2014; World Bank, 2015). Descriptive norms typically highlight how many other individuals or firms are complying, which is also indicative of normative support for the behavior. The decision to comply may also be influenced by moral costs of unfairness and inequity when others are complying, and the literature sometimes categorizes such interventions as fairness interventions. We find that, in general, social norms messages have been more successful in the context of income tax compliance than for other kinds of taxes. The success of social norms messages may depend on the beliefs that taxpayers already hold about compliance (Hallsworth, 2014).

In their seminal experimental study, Hallsworth et al. (2017) found that highlighting descriptive norms relating to tax payment may be one of the more effective ways of encouraging tax compliance in the U.K., and that it is more effective than highlighting injunctive norms. A follow-up experiment indicated that highlighting more specific norms—e.g., norms pertaining to an individual's geographic location or financial situation—may be even more successful. In a previous study in the U.S., Coleman (1996) also found descriptive norms messages to be effective. In a more recent experiment, Kettle et al. (2016) found a message highlighting descriptive norms to be one of the two most successful messages for increasing compliance in Guatemala. The experiment showed that highlighting descriptive norms that were not necessarily high (64.5%) still had a positive impact on compliance, for both individuals and firms. Similarly, Del Carpio (2014) found that informing individuals about descriptive norms for property tax payments increased compliance in Peru, after finding that these tax payments were underestimated at the baseline.

In some instances, social norms messages have not worked. Hernandez et al. (2017) even found that they had a negative effect in the context of personal income tax in Poland. In addition, Castro and Scartascini (2015) found that a message about descriptive social norms had no effect in the context of property taxes in Argentina. Similarly, Dwenger et al. (2016) found that social norms messages had no impact in the context of the church tax in Germany, Fellner et al. (2013) found generally weak evidence that they affected compliance rates in the context of TV license fees in Austria, and John and Blume (2018) found that they led to lower compliance rates in the context of council tax in London.

2.2.D Commission

Another "moral suasion" message that has been shown to improve compliance is appealing to an individual's personal sense of duty, or personal norms. For example, recent experiments have shown that letters that frame non-compliance as an intentional and deliberate choice typically do well in increasing compliance. This may be because the impending losses from acting can hurt more than gains from compliance (Kahneman & Tversky, 1979). Put another way, moral violations appear to be less serious when resulting from inaction (Descioliet al.,

2012; Kettle et al., 2016; Mazar & Hawkins, 2015). In general, individuals are often less comfortable with unethical behavior when it is described as being an intentional action rather than a failure to take action (Ritov & Baron, 1990). Accordingly, in large scale field experiments, commission messages in Poland and Guatemala led to larger increases in compliance than other messages (Hernandez et al., 2017; Kettle et al., 2016). These messages are often "harder toned" and may also fit within the deterrence category of messages, as they may work by changing perceptions of audit probabilities.

2.3 Social, Monetary, and Non-Monetary Rewards

Beyond deterrence and moral appeals, can taxpayers be directly incentivized to comply? Behaviorally-informed interventions may work, primarily through extrinsic rather than intrinsic motivation, and can include social as well as monetary rewards. In an early lab experiment, Alm et al. (1992) concluded that rewards that are more immediate and salient (such as a lottery or fixed reward) work better than audit reductions or public goods. In general, lotteries, including tax lotteries, may work well, as individuals overweight small probabilities. Subsequent evidence from field experiments has been largely positive.

For example, Dwenger et al. (2016) found interesting results in a field experiment examining a local church tax in Germany. They tested interventions that included a lottery, social recognition in a local newspaper, or both. The results were different for baseline compliers, who increased their contributions, particularly for interventions that included social recognition, and evaders who decreased their contributions. Similarly, Koessler et al. (2016) found non-monetary rewards (such as a weekend getaway) to be more effective than monetary rewards in Switzerland. Carrillo, Castro et al. (2017) found that being given the opportunity to win the municipality lottery in Argentina increased compliance but this was persistent only when a durable good (i.e., the sidewalk) was provided. However, Dunning et al. (2016) found that providing compliant taxpayers in Uruguay with a tax holiday led to a decrease in compliance after the tax holiday had taken place.

Tax authorities around the world also use social shaming as a tool to increase compliance. They usually do this by publishing lists of delinquent taxpayers online. Field experiments examining social shaming interventions have found that results here are often sensitive to baseline levels of compliance.

In a lower income context, in Bangladesh, Chetty et al. (2014) showed that sharing information about firms' compliance with peers increased VAT payments for firms in clusters where at least 15% of firms were complying at the baseline. The intervention meant that firms knew that their tax compliance information would be shared with other firms in the cluster. In a more directed shaming experiment in the U.S., Perez-Truglia and Troiano (2018) randomly informed neighbors about delinquent taxpayers via an online list and found that this had significant effects on the first quartile of delinquents and those who owed less money. Brockmeyer et al. (2016) showed that an SMS message threatening to publish delinquent firms' names online increased filings significantly.

In the context of the sales tax at the end of the VAT chain, an alternative is to incentivize consumers to improve compliance by firms. This provides useful third-party information when the audit trail breaks down in the final sale from retailer to consumer (Pomeranz, 2015). Naritomi (2016) found that rewarding consumers in Brazil with tax rebates and lottery tickets increased compliance by retail firms.

2.4 Simplification, Information, Timing, and Delivery Channels

As a first step, most field experiments include a simplification of the communication to taxpayers or the provision of basic information, as tax systems can be inherently complex and hard to navigate. Individuals in such tax systems may find it harder to predict their true levels of tax liability. In an early lab experiment, Alm et al. (2010) showed how providing taxpayers with information can increase both tax filings and income. The Cabinet Office Behavioural Insights Team (2012) highlight a few key lessons in designing such communications effectively, such as personalizing the language and highlighting the key actions to be taken. Hernandez et al. (2017) showed how simplified intervention letters improved compliance in Poland when compared to a conventionally worded letter sent to the control group. Similarly, Dwenger et al. (2016) found that using simplified mailings increased contributions significantly in the context of a local church tax in Germany. Robitaille et al. (2020) found that, in Ontario, Canada, planning prompt interventions increased the chances that organizations would file their overdue taxes. In addition, while Robitaille et al.'s (2020) intervention did not appear to have effects that persisted across tax years, organizations did not habituate to the manipulation and its effects were consistent across repeated exposures. Bhargava and Manoli (2015) found that U.S. taxpayers who were eligible for the earned income tax credit (EITC) were most likely to respond to various simplifications in mailings to increase filings. John and Blume (2018) found that simplification improves compliance in respect of council tax payments in London.

In the Rwandan context, Mascagni et al. (2017) successfully used images along with messages about deterrence and fiscal exchange to provide better information. In the U.S., Guyton et al. (2017) found that sending postcards and brochures to individuals who had not filed their returns in recent years, and who were potentially eligible for the EITC, was effective. Discussing benefits and where to get further information helped individuals in the treatment groups to file more returns, both in order to claim withholdings and to make voluntary payments, although these effects did not persist over time

Researchers conducting field experiments have varied the timings of communications with taxpayers based on their policy objectives. For example, if the objective is to increase the tax base in the context of high evasion and/or low tax to GDP ratios, letters are typically sent right before or during the reporting period to increase salience (Mascagni et al., 2017). However, if individuals often forget to, or do not, pay their tax liabilities after reporting has been completed, letters are sent soon after the payment deadline has passed (as in Hallsworth et al., 2017)

Finally, the communication delivery channel can be important. For example, Ortega and Scartascini (2015) used a variety of channels when communicating with delinquent individuals in Columbia, sending letters, emails, and conducting in-person visits. They found that in-person visits had the greatest impact. Similarly, Dorrenberg and Schmitz (2017) found that delivering messages in person achieved better results than delivering them by letter for small firms in Slovenia. Mascagni et al. (2017) found that, overall, the SMS channel was more effective than letter or email in Kenya. However, Hernandez et al. (2017) did not find a difference in impact when delivering letters by regular and registered mail in Poland.

2.5. Summary

Although it is clear that the overall literature on behavioral approaches to tax compliance is expansive, it is also the case that much remains unknown. As with most behavioral science interventions, the precise combination of tax type, target population (e.g., income level or firm versus individual), social and cultural norms, timing, framing of the message, and delivery channel etc. can greatly influence the magnitude or even the sign of the impact. Although the results of previous studies yield strong hints about what might work where, they are hardly dispositive, especially given the large number of possible permutations of inputs. However, in spite of the mixed results, we do see a few patterns starting to emerge. Deterrence messages have increased compliance in a number of different field experiments, but it is important to note the different sources of heterogeneity in these results. For other types of messages, we find that messages highlighting the tax behavior of others (i.e., social norms) and harder toned omission/commission messages seem to show promise in terms of improving income tax compliance. In the future, more quantitative meta-analysis could be conducted in order to better identify patterns, and assess the likelihood of different types of messages working in different contexts and across types of taxes.

3. AN APPLICATION TO LATVIA: CONTEXT, DATA, AND DESIGN

The informal shadow economy in Latvia is estimated to be approximately one quarter of the size of the country's GDP, compared to an average of 14.4% across the OECD countries (Hazans, 2011; World Bank, 2017). Unsurprisingly, it has one of the lowest ratios of tax revenue to GDP of developed countries: at 29%, this is five percentage points below the OECD average and a full ten percentage points below the European Union average (World Bank, 2017). Being able to increase tax revenues by even a small fraction of GDP would make a tremendous difference to the government's ability to function well and provide services to its citizens.

Spurred on by these facts, Latvia's Ministry of Finance collaborated with the World Bank on a holistic review of the country's tax system, with the intention of using this to help with the design of a new and improved tax strategy. As a complement to the comprehensive review, and inspired by the literature described above, the SRS (the Latvian tax authority) worked with the Mind, Behavior, and Development (eMBeD) unit at the World Bank on a pilot field experiment to use preemptive, behaviorally-informed messages to increase tax compliance.

All eligible residents of Latvia are required to submit an Annual Income Declaration (AID) between March 1st and June 1st. The SRS determined that the most relevant target group for the field experiment to increase compliance would be those individuals who did not primarily receive regular salaried income and who had been delinquent previously. To that end, they identified all self-employed individuals who had either submitted their AID late or failed to submit it in one or more of the tax years 2013-2015.

Tables 1 and 2 below provide more information about the study sample identified by the Latvian tax authority. Table 1 shows its demographic characteristics, as well as the revenue reported by the sample in the 2015 tax year and the proportion of income reported from business activity. The table shows that 58% of the group had delayed submitting their return the previous year (while the remaining members had delayed submitting in prior years) and, on average, their share of business income was nearly half of their total income, at 49%.

While these individuals are part of the tax system, they differ from the average individual taxpayer in at least two ways. First, these individuals had not submitted their returns by the deadline in at least one of the three previous years, and second, the delay in their submission was substantial, as shown in Table 2. For example, in a sub-sample analysis of 1166 individuals who had delayed submission in the past three years, the mean delay during that period was 144 days, with 20% failing to submit returns in the 2013 tax year and 15% in the 2014 tax year.

Table A1 (in the Appendix) shows the 25 strata of interest to the Latvian authorities. These strata may, primarily, have been of interest because the behaviors may have been different across these groups, although the study was not powered to detect differences across these groups. The main stratification variables of interest included age, revenue in the 2015 tax year, and dependence on business activity income.

Table 1: Basic characteristics (entire sample)

	Mean	SD	Min	Max	N
Female	0.56	0.50	0.00	1.00	4,324
Age (years)	47.02	14.49	19.00	98.00	4,324
Ever Married	0.74	0.44	0.00	1.00	4,324
Income in 2015 (Euro)	13,327.33	25,855.67	5.35	978,902.76	4,324
Delay in submitting return last year (versus in previous years)	0.58	0.49	0.00	1.00	4324
Share of business income	0.49	0.38	0.00	1.00	4324

Table 2: Delay in submission of AID among the "high-risk" target sample (subsample)

	Mean	SD	Min	Max	N
taxationyear2013 (days)	201.45	247.56	3.00	942.00	1166
taxationyear2014 (days)	148.63	152.96	3.00	578.00	1166
taxationyear2015 (days)	81.83	59.40	3.00	213.00	1166
Delay days (over 3 years)	143.97	128.96	4.00	577.33	1166

In total, 4,324 individuals pre-emptively (i.e., before any delinquency in 2017) and randomly received one of three treatment emails or were assigned to a control group that received no

message, resulting in 1,081 individuals per arm[6]. To the best of our knowledge, these emails were sent out right before the reporting period started on March 1st.

We provide further motivation for the selected treatment messages below. Table A5 (in the Appendix) shows the full text of the email messages sent. The first message (T1)—a simple reminder—was selected because the targeted individuals had shown habitual signs of delaying return submissions over the past few years. The message for T2 Omission/Commission was selected because similar messages had been the most effective in increasing compliance in a recent study in Guatemala (Kettle et al., 2016) and had also been effective in Poland (Hernandez et al., 2017). It also had a "harder" tone, than the messages in our other two interventions. Finally, the T3 Social Norm message was included because this message has been effective in a number of recent field experiments (although it had negative effect in Poland; see Hernandez et al., 2017), as discussed in Section 2.

T1 Simple Reminder: Tax letters, or any other form of communication from the government, typically contain multiple pieces of key information that are often hidden within legal jargon. The first step when revising any communication is to simplify it, by personalizing the message, and using clear, directed language. Consequently, this email reminded individuals of the tax timeline and included a link to the online system as well as contact information in case of questions. It was signed off with the name of the Chief Tax Inspector to make it more personal, as the names of the recipients could not be included for technical reasons. In summary, it contained three short, easy-to-read sentences, without extraneous information.

T2 Omission / Commission: In addition to the text from T1, this email stated that previously missed deadlines had been considered to be unintentional and inadvertent (i.e., honest omissions). However, going forward, failures would be considered to be deliberate acts of non-compliance (i.e., commissions). Framing non-compliant behavior as a deliberate choice reduces ambiguity about inaction, increases moral obligations towards action, and likely increases perceived deterrence.

T3 Social Norms: Along with the text of T1, this email highlighted the descriptive social norm that an increasing number of taxpayers file their AID by the deadline each year. This draws on the insight that people tend to follow others, in part due to normative inferences about what others believe is the right thing to do. While social norms messaging typically includes a specific descriptive statistic relating to compliance, specific statistics were unavailable, so we included language about the real increasing trend instead.

4. RESULTS

The primary outcome measure of the experiment was AID submission by the deadline (June 1st)[7]. Table A2 (in the Appendix) shows the balance tests. Age, past tax submission behavior, past revenue, and dependence on business activity were balanced by design. There is some imbalance with regard to gender and marital status, and we control for this in the regressions (Columns 2 and 4 in Table 3 below). To the best of our knowledge and understanding from conversations with SRS, all emails were sent out, and they received call backs from some

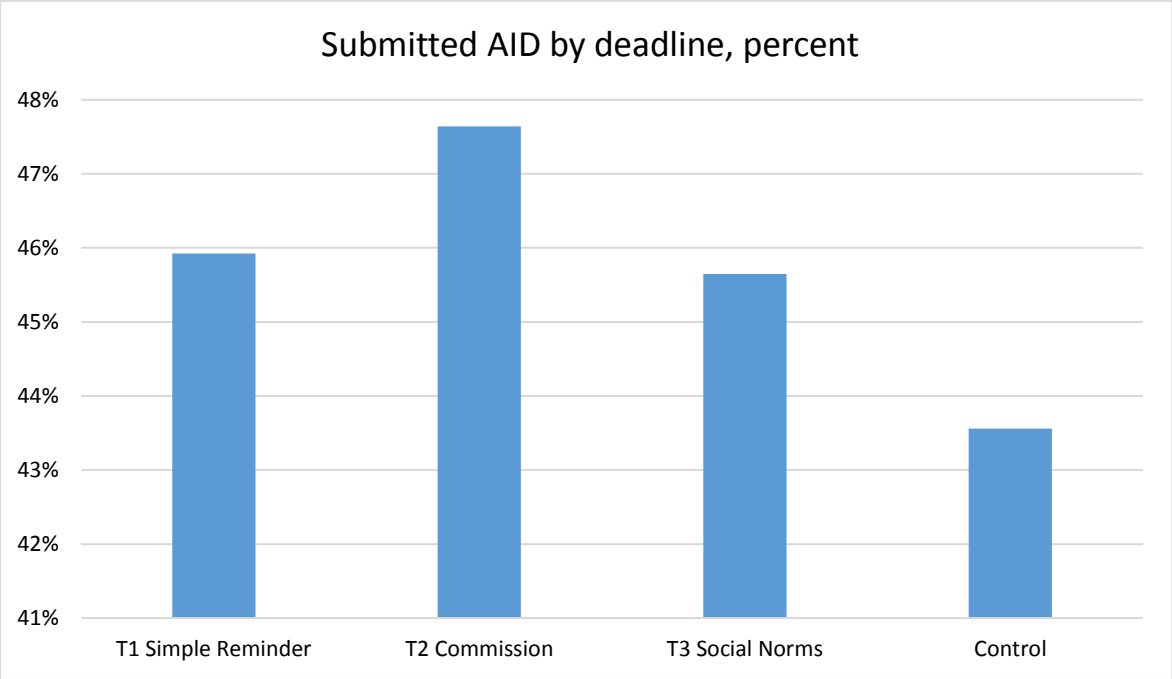
[6] Initial sample size calculations for detecting a 0.1 SD decrease in submission delay required about 1,550 individuals per treatment arm, so the study was underpowered.

[7] The final sample size is 4,320. We dropped four individuals who had paid before the start of the payment period (i.e., March 1st).

recipients on specific phone numbers listed in the emails. We were, however, unable to ascertain whether the recipients of the emails had opened and read them.

43.6% of the control target population had submitted their declarations by the deadline. AID submission in every treatment group was higher than in the control group (see Figure 1 below). Table 3 shows OLS results for simplicity of interpretation (see Table 3A in the Appendix for the logistic regression results). Submissions in the T1 (reminder) and T3 (social norms) groups were 5.5% (i.e., 2.4 percentage point) and 4.8% (2.1 percentage points higher respectively than the control group yet they were not statistically different from it. Submissions in T2 (commission) were 9.4% (4.1 percentage points) higher than the control group—a statistically significant difference ($p=0.05$). These results become stronger when controlling for basic demographic information, and past income and tax compliance behavior, and the treatment effect in T2 (commission) was 4.2 percentage points higher than the control group, as shown in Column 2 of Table 3.

Figure 1: Submission of AID by deadline across treatment groups



In addition, 63% of the control group had submitted declarations by July 17th (46 days or 1.5 months after the deadline), the last date for which we have data. Figure A1 shows the monthly submissions across the treatment arms for the entire period for which we have data. Submissions made by mid-July were highest in the social norms group, yet this was not statistically significant: 5% (3.2 percent points) higher than the control (also shown in Table 3, Column 3). However, when we controlled again for basic demographics, and past income and tax behavior, compliance in this treatment group was higher (3.6 percent points) and significant ($p=0.075$).

Table 3: Main OLS regression results

VARIABLES	(1) Submitted by deadline	(2) Submitted by deadline	(3) Submitted	(4) Submitted
T1: Simple Reminder	0.0238	0.0238	-0.00615	-0.00621
	[0.0210]	[0.0210]	[0.0203]	[0.0202]
T2: Commission	0.0408*	0.0421**	0.0247	0.0264
	[0.0210]	[0.0210]	[0.0203]	[0.0202]
T3: Social norms	0.0209	0.0237	0.0318	0.0360*
	[0.0210]	[0.0210]	[0.0203]	[0.0202]
Female		0.0319**		0.0529***
		[0.0153]		[0.0148]
Age		-0.00184		-0.00295***
		[0.00113]		[0.00108]
Ever Married		0.00265		0.00861
		[0.0200]		[0.0192]
Delay last year		0.264		0.187
		[0.176]		[0.169]
Ln(Total Revenue in 2015)		0.0217**		0.0478***
		[0.0101]		[0.00971]
Share of business income		-0.0246		0.0394
		[0.0301]		[0.0289]
Constant	0.436***	0.328***	0.630***	0.586***
	[0.0149]	[0.118]	[0.0143]	[0.113]
Fixed Effects	Yes	Yes	Yes	Yes
Observations	4,320	4,320	4,320	4,320

Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table 4 shows the number of days until submission and the correlation of various taxpayer characteristics with submissions of the AID. Those who had delayed submission in the previous year (2015) were more likely to submit their returns by the deadline than those who had delayed submitting their AIDs in prior years. This highlights the importance of, when feasible, communicating earlier with taxpayers prevent them from habitually delaying submissions. Individuals who were female and had higher revenues in the 2015 tax year were also more likely to submit their AIDs by the deadline.

We also investigated whether compliance by gender was differential across the treatment groups (shown in Table A4 in the Appendix), as women may have responded differently (Croson & Gneezy, 2009). While the study was not sufficiently powered to test for heterogeneity in treatment effects in subgroups, we still observed some interesting patterns. In particular, women were more likely to respond to the omission / commission and social norms messages (Columns 1 and 3), by 3.4 and 3.0 percentage points respectively when compared to the control group. Men were more likely to comply with the reminder message and omission / commission message (by 3.6 and 5 percentage points respectively; see Columns 2 and 4). This shows that the increased compliance in the omission / commission treatment arm was driven by both genders, but it also suggests that, in this setting, women were more likely to be persuaded by social norms messages.

Table 4: Other OLS regression results

VARIABLES	(5) Days to Submission	(6) Submitted by deadline	(7) Submitted
T1: Simple Reminder	-1.717		
	[2.007]		
T2: Commission	-1.089		
	[1.986]		
T3: Social norms	-2.816		
	[2.006]		
Female		0.0354**	0.0566***
		[0.0152]	[0.0146]
Age		0.000498	-0.000284
		[0.000588]	[0.000565]
Ever Married		-0.00471	0.0123
		[0.0193]	[0.0186]
Delay last year		0.184***	0.140***
		[0.0152]	[0.0146]
Ln(Total Revenue in 2015)		0.0170***	0.0490***
		[0.00598]	[0.00574]
Share of business income		-0.0245	0.0568***
		[0.0204]	[0.0196]
Fixed Effects	Yes	No	No
Observations	1,974	4,320	4,320

Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

5. CONCLUSION

In this paper, we applied two of the more successful behavioral interventions (commission and social norms messages) from previous tax experiments, along with a simple reminder message, in a pre-emptive intervention which was set up to reduce delinquency. We showed that behaviorally-informed tax communication can be effective in improving tax compliance, even when targeted towards individuals who are partially or fully self-employed, and who have been delaying in the submission of, or failing to submit, their returns in the past few years. The context is that of a newly independent country, Latvia, where the shadow economy has historically played a large role. The experiment shows that any portions of this shadow economy that are familiar to the tax authority can be targeted successfully with simple interventions. We found that, as in Guatemala (Kettle et al., 2016), the most successful message in Latvia was the harder toned message, which made salient the role of deliberate active choice in non-compliance. We found that simple reminder and social norms messages also increased timely submissions, but not significantly so. However, the study was underpowered to distinguish treatment heterogeneity, such as on those individuals who have a higher proportion of own income.

The results show promise for future research. First, we believe there is a high demand for policy-relevant experimentation in Latvia and similar countries, where tax authorities are actively looking for policy tools to help them to reduce the size of the shadow economy, and strongly encourage such collaborations. Finally, the differential impact of such interventions on the different groups that comprise the shadow economies could be better understood by investigating these questions with larger samples.

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APPENDIX

Table A1: Table shows the 25 strata used for the randomization.

Strata	Dependence on Revenue from Business Activity	Age Group	Revenue Group (based on taxation year 2015)	AID Submitting Discipline
1	High	Under 30 years	Under 10 000 EUR	AID submission delay for last taxation period
2	High	Under 30 years	Under 10 000 EUR	AID submission delay for last 2-3 years
3	High	Under 30 years	10 000 EUR - 100 000 EUR	AID submission delay for last taxation period
4	High	Under 30 years	10 000 EUR - 100 000 EUR	AID submission delay for last 2-3 years
5	High	31-50 years	Under 10 000 EUR	AID submission delay for last taxation period
6	High	31-50 years	Under 10 000 EUR	AID submission delay for last 2-3 years
7	High	31-50 years	10 000 EUR - 100 000 EUR	AID submission delay for last taxation period
8	High	31-50 years	10 000 EUR - 100 000 EUR	AID submission delay for last 2-3 years
9	High	Over 51 years	Under 10 000 EUR	AID submission delay for last taxation period
10	High	Over 51 years	Under 10 000 EUR	AID submission delay for last 2-3 years
11	High	Over 51 years	10 000 EUR - 100 000 EUR	AID submission delay for last taxation period
12	High	Over 51 years	10 000 EUR - 100 000 EUR	AID submission delay for last 2-3 years
13	Low	Under 30 years	Under 10 000 EUR	AID submission delay for last taxation period
14	Low	Under 30 years	Under 10 000 EUR	AID submission delay for last 2-3 years
15	Low	Under 30 years	10 000 EUR - 100 000 EUR	AID submission delay for last taxation period
16	Low	Under 30 years	10 000 EUR - 100 000 EUR	AID submission delay for last 2-3 years
17	Low	31-50 years	Under 10 000 EUR	AID submission delay for last taxation period
18	Low	31-50 years	Under 10 000 EUR	AID submission delay for last 2-3 years
19	Low	31-50 years	10 000 EUR - 100 000 EUR	AID submission delay for last taxation period
20	Low	31-50 years	10 000 EUR - 100 000 EUR	AID submission delay for last 2-3 years
21	Low	Over 51 years	Under 10 000 EUR	AID submission delay for last taxation period
22	Low	Over 51 years	Under 10 000 EUR	AID submission delay for last 2-3 years
23	Low	Over 51 years	10 000 EUR - 100 000 EUR	AID submission delay for last taxation period
24	Low	Over 51 years	10 000 EUR - 100 000 EUR	AID submission delay for last 2-3 years
25			Over 100 000 EUR	

Figure A1: Submission of AID by month

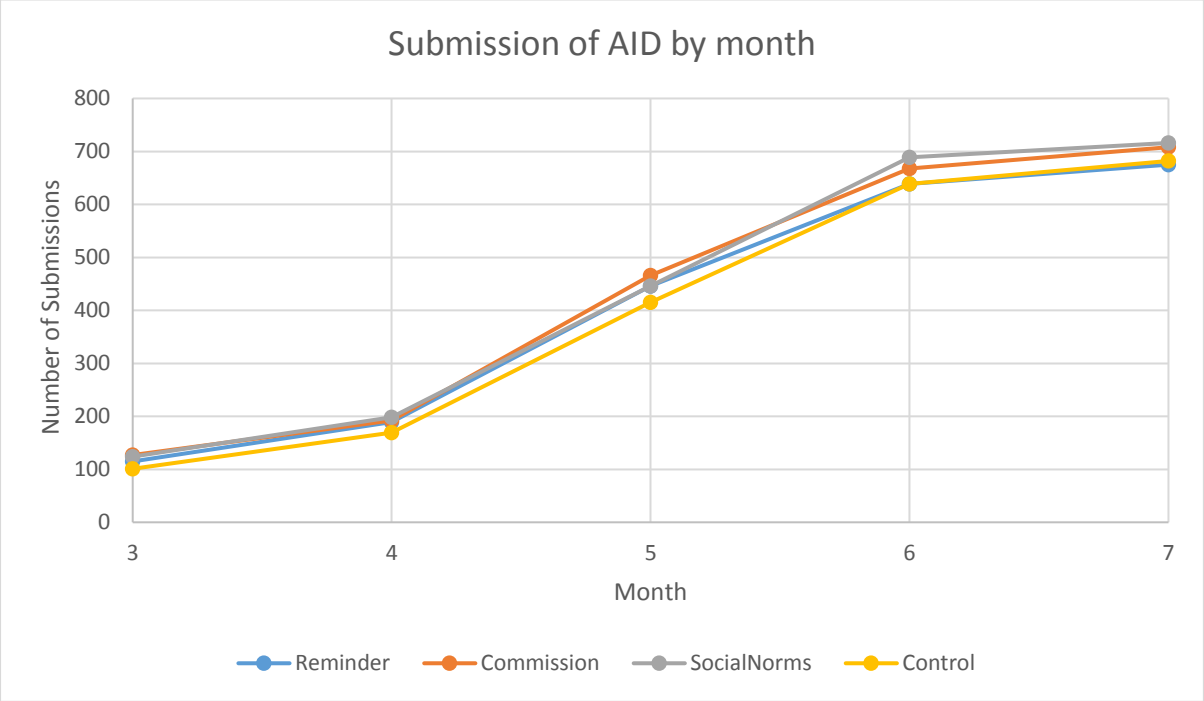

Table A2: Balance tests

	Simple Reminder	Commission	Social Norms	Control	(1) vs. (2), p-value	(1) vs. (3), p-value	(1) vs. (4), p-value	(2) vs. (3), p-value	(2) vs. (4), p-value	(3) vs. (4), p-value
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Female	0.592	0.555	0.550	0.553	0.082	0.051	0.068	0.829	0.931	0.897
	(0.015)	(0.015)	(0.015)	(0.015)						
ever_married	0.745	0.718	0.763	0.732	0.160	0.318	0.494	0.016	0.470	0.092
	(0.013)	(0.014)	(0.013)	(0.013)						
age_years	47.082	47.004	47.145	46.847	0.901	0.919	0.707	0.820	0.804	0.628
	(0.442)	(0.450)	(0.430)	(0.440)						
delay_last_yr	0.583	0.581	0.581	0.582	0.931	0.931	0.965	1.000	0.965	0.965
	(0.015)	(0.015)	(0.015)	(0.015)						
Total revenue in 2015	13646.759	12826.767	13241.847	13593.938	0.497	0.757	0.966	0.675	0.378	0.727
	(1047.177)	(599.683)	(788.127)	(630.610)						
dependence_high	0.236	0.234	0.236	0.237	0.919	1.000	0.960	0.919	0.879	0.960
	(0.013)	(0.013)	(0.013)	(0.013)						
N	1081	1081	1081	1081						

Table A3: Main results, logistic regression

VARIABLES	(1) Submitted by deadline	(2) Submitted by deadline	(3) Submitted	(4) Submitted
T1: Simple Reminder	1.106	1.106	0.973	0.973
	(0.0979)	(0.0982)	(0.0884)	(0.0889)
T2: Commission	1.188*	1.195**	1.119	1.127
	(0.105)	(0.106)	(0.102)	(0.104)
T3: Social norms	1.093	1.106	1.156	1.180*
	(0.0967)	(0.0983)	(0.106)	(0.109)
Female		1.145**		1.273***
		(0.0742)		(0.0856)
Age		0.992		0.987***
		(0.00472)		(0.00490)
Ever Married		1.011		1.039
		(0.0854)		(0.0905)
Ln(Total Revenue in 2015)		1.096**		1.235***
		(0.0469)		(0.0542)
Delay last year		2.953		2.516
		(2.200)		(2.029)
Share of business income		0.903		1.201
		(0.114)		(0.157)
Strata Dummies	Yes	Yes	Yes	Yes
Observations	4,320	4,320	4,320	4,320

Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A4: Submission by deadline heterogeneity by gender

	(1)	(2)	(3)	(4)
	Submitted by deadline	Submitted by deadline	Submitted by deadline	Submitted by deadline
Group	Female	Male	Female	Male
T1: Simple Reminder	0.0118	0.0362	0.0123	0.0372
	[0.0281]	[0.0319]	[0.0281]	[0.0320]
T2: Commission	0.0335	0.0504	0.0343	0.0517*
	[0.0285]	[0.0312]	[0.0285]	[0.0312]
T3: Social norms	0.0301	0.0124	0.0304	0.0148
	[0.0286]	[0.0312]	[0.0286]	[0.0312]
Age			-0.00314**	-7.61e-05
			[0.00150]	[0.00173]
Ever Married			0.00233	-0.00495
			[0.0271]	[0.0303]
Delay last year			1.046**	0.114
			[0.450]	[0.190]
Ln(Total Revenue in 2015)			0.0188	0.0224
			[0.0135]	[0.0154]
Share of business income			-0.0352	-0.0140
			[0.0390]	[0.0479]
Constant	0.454***	0.412***	-0.165	0.161
Strata Fixed Effects	Yes	Yes	Yes	Yes
Observations	2,431	1,889	2,431	1,889

Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A5: Text of email treatment messages

Treatment 1: Simple Reminder

Subject: Submit your Annual Income Declaration

Hello!

We remind you that the Annual Income Declaration (AID) can be submitted in the Electronic Declaration System (EDS) during the period: 1st of March 2017 – 1st of June 2017.

A brief guide on how to submit the AID in the EDS is available here (link provided).

In case of questions, please contact the Chief Tax Inspector Dace Liepiņa (phone number).

Thank you!

Treatment 2: Commission

Subject: Submit your Annual Income Declaration to avoid potential penalty

Hello!

We hereby inform you that any delay in the submission of the Annual Income Declaration (AID) this year will be considered an intentional and deliberate choice made by you, and a penalty as per the Administrative Violations code of Latvia may be applied.

We remind you that the Annual Income Declaration (AID) can be submitted in the Electronic Declaration System (EDS) during the period: 1st of March 2017 – 1st of June 2017.

A brief guide on how to submit the AID in the EDS is available here (link provided).

In case of questions, please contact the Chief Tax Inspector Gunta Kazāka (phone number)

Thank you !

Treatment 3: Social Norms

Subject: Submit your Annual Income Declaration, just like your peers!

Hello!

The number of taxpayers who submit the Annual Income Declaration (AID) on time is increasing more and more.

We remind you that the Annual Income Declaration (AID) can be submitted in the Electronic Declaration System (EDS) during the period: 1st of March 2017 – 1st of June 2017.

A brief guide on how to submit the AID in the EDS is available here (link provided).

In case of questions, please contact the Chief Tax Inspector Elizabete Strade (phone number)

Thank you!