

# Economics and Business Review

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# Enhancing garbage fee compliance: Insights from a Slovak municipality

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## Abstract

Tax avoidance and tax evasion remain critical challenges for central or local governments and municipalities. This non-compliance also represents an ethical issue since individuals who benefit from publicly provided services do not contribute to their financing as they are legally required. The study aimed to test whether the use of behavioural interventions would reduce the number of non-payers of the garbage collection fee in the city of Hlohovec, Slovakia. The experiment was carried out by distributing leaflets to households with permanent residence in Hlohovec. The subjects of the experiment were randomly divided into three groups. Households in the control group (number of households is 1,718) did not receive any leaflets, households in the first intervention group (number of households is 1,721) received a leaflet containing a social norm, and households in the second intervention group (number of households is 1,625) received a leaflet containing a deterrent message. Ordinary least squares (OLS) regressions were used to analyse the data. The results showed that using a social norm did not significantly increase the number of garbage collection fee payers. At the same time, leaflets with deterrent messages led to an increase in outstanding debt. These results suggest that people reacted unfavorably to the perceived threat (deterrent message), and the opposite effect occurred, i.e. this type of intervention led to an increase in the number of non-payers of garbage collection fee.

## Keywords

- behavioural interventions
- nudge
- randomised controlled trial
- garbage fee collection
- local government
- social norm
- deterrence

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## Introduction

In recent years, the use of behavioural interventions has gained popularity in the field of public policy, and governments have increasingly applied behavioural insights to enhance the effectiveness of public policies and their benefits to society (OECD, 2017). Behavioural interventions implemented in public policies rely primarily on nudges and choice architecture to guide people’s actions while preserving their freedom of choice.

Tax avoidance and evasion remain critical challenges for central and local governments and municipalities, despite their being illegal. Additionally, lower budget revenues are collected at the central or local levels, leading to fewer resources to finance the provision of public goods and services.

Traditionally, efforts to address tax non-compliance have focused on enhanced enforcement and tax audits. These measures rely on fines and other forms of penalties as deterrents to tax evasion. However, taxpayers’ behaviour is significantly influenced by behavioural factors, such as social norms, sense of justice, and the simplicity and comprehensibility of the tax system.

Incorporating behavioural interventions in tax/fee collection systems offers a promising avenue for improving the effectiveness of these processes and addressing the challenge of non-compliance. Policymakers can achieve better outcomes with minimal cost and effort by understanding the behavioural factors that influence people’s decisions and designing interventions that nudge them toward desired behaviours.

This paper is based on the results of a randomized controlled trial (RCT) conducted in 2021 in the Western Slovakian city of Hlohovec, which was aimed at improving compliance with payment of the garbage collection fee. The payment of this fee was identified as a pressing problem by the municipality, as non-compliance rates were increasing and were the highest among locally imposed fees and taxes.

Households in Hlohovec were randomly allocated to one of two treatment groups or a control group based on the first letter of the household head's surname in alphabetical order. Households in the treatment groups received a modified version of the invoice along with either a leaflet emphasising social norms or a deterrence leaflet, while the control group received an unmodified invoice. The experiment was designed to evaluate the effectiveness of these two types of behavioural interventions for improving compliance with the garbage collection fee.

The study emphasises the importance of a well-designed and implemented methodology within the local governance, and the need to adhere to relevant legislative frameworks and the specific competencies of the corresponding level of government. However, our results indicate that behavioural interventions based on social norms and deterrence did not have a positive influence on households' behaviour. Thus, our study emphasises the need for a more in-depth exploration of the factors that shape households' compliance behaviour.

The structure of the paper follows a logical sequence. Section 1 provides an overview of the relevant literature on behavioural interventions in tax/fee collection, which provides the context for the subsequent sections. Section 2 describes the context of the experimental design and the implemented intervention. Section 3 provides details on the methodology used to evaluate the effectiveness of the intervention. Section 4 presents the results. Finally, the paper ends with concluding remarks summarising the study findings and their implications for future research and policy.

## **1. Literature review**

Existing behavioural interventions aiming to increase tax compliance and payment of fees commonly involve sending taxpayers modified payment reminders or invoices. In this kind of experiment, subjects in the treatment groups receive modified documents, and those in the control group get unmodified documents or placebo treatments.

One of the most common forms of behavioural interventions in this area is the use of social-norm letters, which aim to influence taxpayers' percep-

tions of tax compliance by pointing to the compliant behaviour of other citizens (Castro & Scartascini, 2015; Dell'Anno, 2009; Grabowski & Korczak, 2023; Lyulyov et al., 2023). Individuals who receive such letters are expected to adjust their perception of tax compliance upwards and, consequently, increase their own compliance. However, Castro and Scartascini (2015) point out that social-norm interventions may not be effective for those individuals whose non-compliance with tax obligations is consistent with their attitudes and beliefs. In such cases, individuals may even change their behaviour in the opposite direction, which then may lead to a boomerang effect.

Several field experiments have been conducted to test the effectiveness of different behavioural interventions with regard to boosting tax compliance. In 1995 and 1996, in Minnesota, USA, tax payment reminders highlighting social norms were used to increase tax compliance. The results showed a statistically significant increase in tax collected from subjects in the intervention group compared to those in the control group (Coleman, 2007).

To enhance timely personal income tax payments, Hernandez et al. (2017) conducted a field experiment in Poland, finding that alterations in the tax form wording significantly boosted payment rates. Negatively framed letters proved to be more effective than positively framed ones. Hallsworth et al. (2017) found that framing reminders with social norms increased tax compliance in large-scale experiments. In contrast, reminders emphasizing budget shortfalls due to lower tax inflows did not yield better outcomes. Iyer et al. (2010) noted a significant increase in the reported tax base when firms were informed about penalties for non-compliance or were made aware of the risk of detection.

In contrast, John and Blume (2018) showed that a descriptive social norm message did not prompt households to pay local taxes on time. Schultz et al. (2007) documented mixed success in changing behaviour using messages, with descriptive normative messages strengthening unwanted behaviour in particular contexts. Del Carpio's (2013) field experiment in Peru revealed that disclosing compliance information significantly increased compliance, and payment reminders had also a positive impact. Similarly, Schächtele et al. (2023) demonstrated that a visually redesigned tax bill highlighting public services increased payment rates among tax non-payers by over 20%. Castro et al. (2022) tested three message types for rental income tax compliance, with detection-focused messages proving to be most successful for boosting tax revenues. However, messages appealing to social norms or altruism had limited direct effects on compliance.

A study by Bobek et al. (2012) looked at the use of social norms as a non-monetary stimulus. The aim of their research was to study the influence of social norms on tax compliance. The authors tested the direct and indirect effects of social norms by simulating a compliance scenario involving 174 experienced taxpayers. The results of the path analysis showed that personal and subjective

norms directly affect tax compliance decisions, while injunctive and descriptive norms exert an indirect influence. This suggests that social norms play an important role in shaping tax compliance behaviour, both directly and indirectly.

The significance of moral principles arising from compliance with social norms was also analysed by Dulleck et al. (2016). The authors studied the influence of psychological stress induced by the potential violation of social norms in the context of tax compliance. The results of their laboratory experiments revealed a positive relationship between psychological stress and tax compliance and highlighted the importance of moral sentiments for tax compliance.

Kleven et al. (2011) stressed the significance of deterrence, noting a large effect on compliance in their research in Denmark. In contrast, Ariel's (2012) findings in the context of corporate tax compliance did not support the deterrence theory, as messages containing deterrence did not have a statistically significant positive effect on tax collection.

Between 2012–2013, Bott et al. (2017) conducted experiments in Norway to increase tax collection from income earned abroad. Nudge letters, particularly those emphasising social norms and the tax office's knowledge of individual income from abroad, led to the highest increase in tax compliance.

Castro and Scartascini (2015) analysed efforts to increase compliance with property tax payments in Argentina. Letters sent to deter taxpayers from tax evasion had a positive, statistically significant effect on compliance. However, letters containing information on the degree of tax compliance of other people living in the municipality or how the tax revenue was to be used did not have a statistically significant impact. Kettle et al. (2016) focused on non-compliers in Guatemala. They found out that letters prompting income tax declaration, providing payment information, including deterrence messages about tax audits, and emphasizing social norms increased most compliance with personal and corporate income taxes.

A field experiment was conducted to investigate the impact of increasing the salience of public disclosure of penalties on the tax compliance behaviour of firms. The findings revealed that messages highlighting the potential for incarceration due to tax evasion were highly effective in increasing tax compliance (Holz et al., 2022). In comparing the standard enforcement regime, involving the threat of outstanding debt being handed over to an Enforcement Agency with nudges comprising letters reminding tax delinquents to settle their tax dues, Andersson et al. (2023) found that the nudge had an effect of approximately 7 percentage points. On the other hand, the standard enforcement regime led to an increase in outstanding debt payments by more than 9 percentage points. Consequently, the effect of the standard enforcement regime was only marginally higher than the effect of the nudge.

In a study conducted in the City of Philadelphia for the calendar year 2015, Chirico et al. (2019) ran an experiment targeting taxpayers in arrears with regard to property tax. Seven alternative formulations of reminder letters were

used, and those threatening economic sanctions for non-compliance were found to be the most effective. However, despite this effectiveness, no evidence indicated improved tax compliance behaviour in 2016 for those who received reminders.

Anderson (2017) investigated the impact of a postcard “nudge” on income tax filers in Nebraska, which aimed to encourage self-reporting of tax liabilities. The nudge more than doubled the likelihood of tax reporting and nearly doubled the revenue collected; however, the overall tax reporting rate remained low, suggesting that an information nudge alone may not substantially change tax reporting behaviour. Simplifying communication from the tax administration consistently improved tax compliance in Belgium, prompting timely payments and encouraging both late filers and payers to comply more swiftly, with positive relationships noted between the use of deterrence messages and tax payments (De Neve et al., 2021).

Latvia implemented a behavioural experiment (Jamison et al., 2021) demonstrating the effectiveness of behaviourally informed tax communication in improving compliance, particularly with the use of a stricter-toned message emphasising deliberate active choice when targeting partially or fully self-employed individuals who delayed or failed to submit returns.

In Belgium, Luts and van Roy (2019) sent reminders to non-compliers with income tax payments, and those containing information about possible sanctions for non-compliance proved most effective. Doshi’s (2017) UK intervention motivated timely tax payments by using letters with behavioural nudges, with the letter emphasising individuals as belonging to a non-paying minority having the largest positive impact on tax collection.

Giarrizzo (2012) conducted a detailed comparative study of monetary and non-monetary incentives for fulfilling tax obligations. She found that paying taxes is often a resisted action, with only a few people predisposed to do so voluntarily, and this reluctance diminishes when people perceive inefficiencies in the system. In such cases, controls and penalties become insufficient and require the introduction of parallel incentives. This study highlights the effectiveness of positive incentives and points to the need to replace the traditional control scheme and penalties with a system that includes both punishments and rewards.

The literature review indicates that behavioural interventions are an inexpensive and relatively simple way to motivate people to comply with their tax obligations. However, the effectiveness of different types of nudges differs. As it has been shown, the effect of nudges based on normative and descriptive social norms was different, as was the effect of those based on social norms and deterrence messages. Also, other factors, such as attitudes toward tax avoidance or cultural factors, affect the impact of behavioural nudges.

The aim of this study is to test whether the use of behavioural intervention would lead to the desired behaviour, specifically, whether the use of be-



havioural intervention would result in a reduction in the number of non-payers of the garbage collection fee in the city of Hlohovec, Slovakia. The results presented in this article contribute to the literature with the experience of implementing behavioural intervention focused on increasing garbage fee compliance in a municipality in Western Slovakia.

## **2. The context of the experiment**

The city of Hlohovec is located in Western Slovakia and has slightly more than 20,000 inhabitants. The municipality identified a problem of non-compliance with the payment of fees for garbage collection, which has been higher compared to compliance with the payment of other municipal taxes and fees. To reduce the share of non-compliers, a behavioural intervention was implemented in 2021. The municipality sends a reminder letter to those residents who do not pay the fee or local tax within the pre-determined period. If the entity does not fulfil its payment obligation even after the late payment deadline, the municipal office refers the case to its legal department, which starts the enforcement process.

The payment procedure for the garbage collection fee is clearly specified. If the fee is below 25€, it must be paid within 15 days of the date of the decision on the payment. If the fee is higher than 25€, the subject can pay the fee in four equal instalments (the first instalment within 15 days and then the remaining three instalments every three months throughout the year, with the last instalment to be paid by the end of November). Despite the possibility of paying the fee in instalments, most subjects decide to pay the fee in one instalment. This can be due to the relatively low size of the nominal fee.<sup>4</sup> However, the garbage collection fee differs among households living in apartment buildings and those living in individual-family houses, and households living in apartments pay lower fees.

According to the Act (2004), if a taxpayer fails to comply and does not demonstrate the payment of the fee within the specified period, the tax or fee administrator may proceed with enforcement proceedings. This involves filing a proposal for enforcement proceedings, which requests a court or executor to enforce the unpaid fee from the debtor. Upon approval of the enforcement proceedings, the executor may proceed to recover the outstanding amount. This can involve various measures, such as confiscating the property of the debtor or freezing their bank accounts. If the court approves the enforcement

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<sup>4</sup> The average annual garbage collection fee among the households in the sample was approximately 79 euros.

proceedings, the executor may confiscate the debtor's assets to recover the outstanding amount, including any interest and costs associated with the enforcement. However, specific procedures may be adjusted depending on the type of the fee and local regulation.

### 3. Methods

Leaflets<sup>5</sup> containing behavioural nudges were sent to citizens by regular mail, together with the invoice for the annual fee for garbage collection. Thus, the subjects who use electronic communication with the municipal office were excluded from the sample. Thus, there may be some selection bias in the sample, given that younger or more educated people may use electronic communication more frequently. Business entities were not included in the intervention.

The subjects were assigned to one of the two intervention groups or a control group. Randomization was performed based on the alphabetic order of the subject's surname. The information system used by the municipality assigned a registration number to each taxpayer and this way to anonymise the subjects. The intervention group that received the social norm leaflet comprised 1,721 households, and the intervention group that received the deterrence leaflet consisted of 1,625 households.

Households in the control group received no leaflet, only a standard invoice for the annual garbage collection. Households in the first treatment group received a leaflet focusing on social norms. This leaflet emphasised that 9 out of 10 citizens of Hlohovec paid this fee on time and urged the recipient to join the paying majority and pay the fee within a pre-determined payment period. Even though the share of non-compliers increased during the COVID-19 period of 2020 and subsequently also in 2021 (see Table 1), it based this nudge on the rate of non-compliers for natural persons (households), which were the subjects of the intervention (i.e. pre-COVID) in 2019. It is believed that the increase in non-compliers during the period when the pandemic affected life and the economy was only temporary. Households in the second treatment group were sent a deterrence leaflet highlighting that if a citizen did not pay the garbage collection fee on time, enforcement proceedings could follow, corresponding to the actual practice applied in the municipality. In order to strengthen the effect of the leaflets, they also included pictures. The format of the invoice for the garbage collection was the same as in the previous years.

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<sup>5</sup> The English version of leaflets used is provided in Appendix B.

In line with existing behavioural research (Athief & Ma'rif, 2023; Castro & Scartascini, 2015; Dell'Anno, 2009 ; Govender & David, 2023; Hamdan et al., 2023; Nikolajenko-Skarbalė & Viederytė-Žilienė, 2023), in this experiment, a leaflet with a behavioural component aimed to influence the perception of compliance with the garbage collection fee payment by other residents of the city and the awareness of the repercussions in case of non-payment.

The experiment was carried out between spring and autumn 2021, which represents the payment period for the garbage collection fee. The data on compliance with the fee payment were collected at the end of 2021.

The data used for the estimation were obtained from a randomised controlled trial in 2021 in cooperation with the city of Hlohovec, Slovakia.

Since 2018, the number of non-compliers with the payment of the municipal waste fee has been increasing among natural persons and legal entities. While in 2018, the share of non-compliers represented approximately 7.3% for natural persons and approximately 5% for legal entities, by 2020, the share of non-compliers among natural persons had more than quadrupled to over 29%, and among legal entities, it had increased more than 8 times and reached almost 45%. Additional information on the number of taxpayers and non-compliers with paying other taxes and fees can be found in Appendix A, Table A1.

The data shows that in the pre-intervention period, the average amount of tax to be paid by Hlohovec citizens in our sample was about 71 euros, with the maximum amount of tax to be paid being about 280 euros (see Table 1).

**Table 1. Summary statistics of the sample**

	Mean	Standard deviation	Minimum value	Maximum value
<b>Pre-intervention period</b>				
Amount of tax to be paid	71.3239	41.0261	0	279.43
Amount of tax paid	65.8510	42.9821	0	279.43
Net outstanding debt	5.4728	21.7273	-23.7	216.3
Living in high-density area	0.8348	0.3714	0	1
<b>Post-intervention period</b>				
Amount of tax to be paid	79.2933	46.0452	0	311.56
Amount of tax paid	62.4242	49.3659	0	311.56
Net outstanding debt	16.7917	36.5535	-155.78	311.56
Living in high-density area	0.8352	0.3710	0	1

Note: The negative value of the net outstanding debt indicates that the payment made by a citizen to the city council was higher than the outstanding fee.

Source: own calculations based on the data provided by the municipality office of the city Hlohovec.

In the post-intervention period, the average amount of tax to be paid increased by about 8 euros, while the maximum amount of tax to be paid by citizens in our sample increased by about 32 euros. The summary statistics also show that compared to the pre-intervention period, the average amount of tax paid by citizens decreased in the post-intervention period, while the average net outstanding debt increased on average threefold in the post-intervention period. The data also shows that the maximum amount of net outstanding debt in the post-intervention period equalled the maximum amount of tax to be paid by citizens (however, in the pre-intervention period, the maximum amount of net outstanding debt was lower than the maximum amount of tax to be paid).

The data sample includes households living in Hlohovec in 2020 (i.e. the pre-intervention period) and in 2021 (i.e. the post-intervention period). The entire data sample consists of 18,403 observations (both for 2020 and 2021), which includes observations in both the pre- and post-intervention periods. However, the sample size used for the estimation is smaller than the entire sample of the households included in the experiment, since those households that moved to/from the city of Hlohovec between 2020–2021 were excluded from the sample. Moreover, some households have permanent residency in other locations and were excluded from the sample.

Just over 1,700 households were randomly assigned to treatment group 1, which received a social norm leaflet with the social norm intervention, and over 1,600 households were randomly assigned to treatment group 2, which received a deterrence leaflet. Approximately 1,700 households were randomly allocated to the control group (see Table 2).

The data shows that in the pre-intervention period, the average outstanding debt of a household in the treatment and control groups was between 5–6 euros. The average outstanding debt of a household in treatment group 1 was 5.91 euros, and for households in treatment group 2, it was 4.99 euros. Households in the control group had an average debt of 5.50 euros. However, in the post-intervention period, when compared with the pre-intervention period, the mean outstanding debt increased in all groups. The average debt increased most among households in treatment group 1 (i.e. about 1.65 percentage points) and the least among households in treatment group 2 (i.e. about 1.35 percentage points). It also increased by 1.58 percentage points among households in the control group during the same period.

Since the average treatment effect on the treated (ATT) and the average treatment effect (ATE) are equal in an RCT, the OLS estimator is consistent for both. In addition, given the substantial sample size of more than 3,000 observations, we used the ordinary least squares (OLS) estimation method, which also offers a straightforward interpretation of the coefficients and facilitates an intuitive understanding of the relationship between the independent and dependent variables:

$$Complier_i = \alpha_0 + \beta_1 Social\ norm_i + \beta_2 Deterrence_i + \varepsilon_i \quad (1)$$

where the dependent variable  $Complier_i$  is a dummy variable that indicates whether a household  $i$  is a complier or not,  $Social\ norm_i$  is a binary variable taking value 1 if household  $i$  was allocated in the treatment group 1 and received the leaflet with the social norm,  $Deterrence_i$  is a binary variable taking value 1 if a household  $i$  was allocated to the treatment group 2 and received the deterrence leaflet and  $\varepsilon_i$  is the robust standard error<sup>6</sup>.

The coefficients of interest are  $\beta_1$  and  $\beta_2$  represent the estimate of the impact of the social norm and deterrence leaflet interventions on compliance with the garbage collection fee payment.

Secondly, the study estimated the impact of the social norm and deterrence treatments on the amount of net outstanding debt on the garbage collection fee. To estimate the causal relationship between the treatments and the amount of net outstanding debt, an ordinary least squares estimation method with the following specification was employed:

$$Debt_i = \alpha_1 + \gamma_1 Social\ norm_i + \gamma_2 Deterrence_i + \theta_i \quad (2)$$

where the dependent variable  $Debt_i$  is the natural logarithm of the net outstanding debt of household  $i$ . The remaining variables are defined in the same way as in the regression specification (1),  $\theta_i$  is the robust standard error.

The coefficients of interest are  $\gamma_1$  and  $\gamma_2$  which represent the estimate of the impact of the social norm and deterrence leaflet interventions on the amount of net outstanding debt on the garbage collection fee.

This assumption is reasonable, as the treatment assignment was random, and households in the intervention and control groups had similar characteristics in terms of demographics, income, and education level.

## 4. Results and discussion

The data shows that the share of compliers with the garbage collection fee payment declined between experimental years 2020 and 2021, both in the treatment and control groups (see Appendix A, Table 2A). The proportion of compliers declined the greatest among households in treatment

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<sup>6</sup> Robust standard errors adjust standard errors to accommodate potential misspecifications in the variance structure of the error term within the classical linear regression framework, e.g., to account for clustering of observations. Therefore, robust standard errors enhance the validity of regression analysis in empirical research.

group 1, which received the social norm leaflet (by 16.2 percentage points). Table 2 presents the results of the balance test. The results show that the estimated coefficients of the covariates, or background characteristics, and the outcome variables are statistically insignificant. This suggests that the background characteristics are balanced along the pre-intervention outcomes. This implies that the allocation to treatment and to control groups is as good as randomly assigned.

**Table 2. The balance in covariates along the pre-intervention outcomes**

	Treatment group 1	Treatment group 2
Compliance	-0.0195 (0.0730)	-0.0292 (0.0733)
Tax to be paid	0.1622 (1.6367)	0.6506 (1.6519)
Amount of tax paid	-0.8582 (1.7441)	1.9181 (1.7598)
Net outstanding debt	1.1455 (1.1841)	-1.2132 (1.1952)
High population density area	-0.0049 (0.0137)	0.0039 (0.0138)

Standard errors are in parentheses.

\*\*\*, \*\*, \* statistically significant at 1%, 5% and 10% level of significance.

Source: own elaboration.

Table 3 presents the estimation results of the effect of the social norm and deterrence leaflets on compliance with garbage collection fee payment. The results show that the social norm leaflet had a positive but statistically insignificant effect on compliance, increasing it by approximately 0.67 percentage points. On the other hand, the deterrence leaflet had a significant negative effect, decreasing compliance with the payment of the garbage collection fee by 2.58 percentage points among households in the treatment group receiving the deterrence leaflet. This suggests that the deterrence letter did not help increase the garbage collection fee payment rate in the city of Hlohovec.

Table 4 presents the analysis of the effect of the social norm and deterrence leaflet on the amount of net outstanding debt on the garbage collection fee. The estimates show that the social norm intervention had a negative but statistically insignificant impact on the net outstanding debt, reducing it by approximately 0.93 percentage points. In contrast, the deterrence leaflet had a statistically significant positive effect on the net outstanding debt, increasing it by approximately 1.33 percentage points.

**Table 3. The effect of individual treatments on compliance with the garbage collection fee payment**

Variables	(1) Col 1
Treatment 1 (social norm leaflet)	0.0068 (0.0084)
Treatment 2 (deterrence leaflet)	-0.0258** (0.0085)
Constant	0.7899*** (0.0059)
Number of observations, <i>N</i>	10,128

Standard errors are in parentheses.

\*\*\*, \*\*, \* statistically significant at 1%, 5% and 10% level of significance.

Source: own elaboration.

**Table 4. The effect of individual treatments on outstanding debt of the garbage collection fee**

Variables	(1) Col 1
Treatment 1 (social norm leaflet)	-0.0093 (0.00669)
Treatment 2 (deterrence leaflet)	0.0133** (0.0067)
Constant	0.1260*** (0.0047)
Number of observations, <i>N</i>	10,128

Standard errors are in parentheses.

\*\*\*, \*\*, \* statistically significant at 1%, 5% and 10% level of significance.

Source: own elaboration.

The estimation results do not suggest a positive effect of the implemented behavioural interventions on compliance with the payment of the garbage collection fee among the sample of households. The social norm leaflet did not have a statistically significant impact on compliance. In contrast, the deterrence leaflet led to a decrease in compliance and an increase in net outstanding debt on the garbage collection fee payment. These results show that the behavioural interventions implemented in the city of Hlohovec did not contribute to increasing the payment rate of the garbage collection fee.

To check for the possible effects of spill-over, the study estimated the impact of the interventions on compliance and net outstanding debt among households living in less and more densely populated areas.<sup>7</sup> The results show significant negative effects of the deterrence leaflet on compliance and significant positive effects on net outstanding debt among households living in less populated areas. However, no statistically significant relationships were observed between individual treatments and compliance with the garbage collection fee payment or the value of net outstanding debt among households in high-density areas. Therefore, the observed impact of interventions on households' compliance behaviour is the result of the interventions and not due to possible mutual communication among households.

The results in Table 5, column 1, confirm the findings in Tables 3 and 4. Specifically, the deterrence leaflet significantly negatively affected the garbage collection fee payment rate among households in areas with low population density, leading to an 11.22 percentage point decrease. Additionally, the same intervention resulted in a statistically significant 8.03 percentage point increase in net outstanding debt among these households. In contrast, the results for households in high-density areas (column 2) did not reveal any significant relationship between the treatments and compliance behaviour or net outstanding debt.

The results of our research are different from the findings of most previous studies, which document a positive impact of social norms or deterrence leaflets on compliance with the payment of fees, or taxes. Specifically, in contrast to Coleman (2007), Hallsworth et al. (2017), and Kettle et al. (2016), as a consequence of the deterrence leaflet, we found an increase in non-compliance with the garbage collection fee. Our findings partially align with Ariel (2012), who found no discernible positive influence of the deterrence message, and Castro et al. (2022), who highlighted the lack of a direct positive impact of social norms. Castro and Scartascini (2015) previously emphasized the occurrence of a reverse or boomerang effect in behavioural interventions addressing tax and fee non-compliance, and this is also reflected in our findings regarding the adverse impact of the deterrence message.

This negative impact on compliance may be attributed to people not liking to be threatened, especially in countries with a history of authoritarian regimes and low compliance levels. Negative compliance may also be linked to trust in public institutions, which is generally low in Slovakia. Therefore, it

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<sup>7</sup> A highly populated area was defined as one with more than 100 households living on the same street. Streets with more than 100 households are the streets with apartment blocks, therefore, people living in these areas are more likely to be exposed to their neighbours than people living on the streets with a lower number of households. In the sample, there are not any streets, with the number of households close to 100-household threshold.



**Table 5. The effect of individual treatments on compliance with the garbage collection fee payment among households in low- and high population density areas**

<b>Dependent variable – compliance with garbage collection fee payment</b>	<b>(1) Low population density</b>	<b>(2) High population density</b>
Treatment 1 (social norm leaflet)	0.0195 (0.0214)	0.0054 (0.0091)
Treatment 2 (deterrence leaflet)	-0.1123*** (0.0203)	-0.0071 (0.0093)
Constant	0.8087*** (0.0144)	0.7860*** (0.0065)
<b>Dependent variable – net outstanding debt</b>		
Treatment 1 (social norm leaflet)	-0.0173 (0.0182)	-0.0083 (0.0071)
Treatment 2 (deterrence leaflet)	0.0803*** (0.0172)	-0.00131 (0.0072)
Constant	0.1179*** (0.0122)	0.1277*** (0.0051)
Number of observations, <i>N</i>	1,679	8,449

Standard errors are in parentheses.

\*\*\*, \*\*, \* statistically significant at 1%, 5% and 10% level of significance.

Source: own elaboration.

is essential to consider the potentially negative effects of interventions that emphasise the negative consequences of non-compliance.

Moreover, the negative impact of the deterrence leaflet on compliance with the payment of the garbage collection fee may suggest that people react adversely to perceived threats and that deterrence interventions may generate a backfire effect. However, the long-term effects of the intervention would need to be studied further, as the experiment was carried out during the COVID-19 pandemic, which could have affected households' compliance behaviour, due to decreased income. However, these results suggest that policymakers should formulate their interventions positively and motivate citizens to comply with policies using a non-deterrence formulation.

Furthermore, additional data on household characteristics such as income or size could provide insights into the results. Nevertheless, it is assumed that these characteristics remained constant over time, and thus, the estimation results are valid and capture the effect of interventions. In addition,

other factors may influence the results of behavioural interventions, and not all of them can be foreseen in advance or reflected in the intervention design. Moreover, the willingness of public authorities to cooperate in the implementation of behavioural interventions plays a crucial role in testing them.

## **Conclusions**

The study aimed to test whether the use of behavioural interventions would lead to the desired behaviour, specifically, whether the use of behavioural interventions would reduce the number of non-payers of the garbage collection fee in the municipality of Hlohovec, Slovakia. The results of the experiment did not confirm the research assumption that the behavioural interventions based on social norm and deterrence would positively affect households' behaviour, increase the payment rate of the garbage collection fee, and decrease the value of related outstanding debt. On the contrary, the deterrence leaflet had a negative impact on compliance with the payment of the garbage collection fee in the post-intervention period. It led to an increase in the corresponding treatment group's outstanding debt. The social norm intervention did not significantly impact compliance with the garbage collection fee payment and related net outstanding debt.

The negative impact of the deterrence leaflet on compliance with the payment of the garbage collection fee indicates that people may react adversely to perceived threats and that deterrence interventions may have unintended consequences and lead to increased non-compliance. Moreover, the analysis highlights the importance of appropriately designed and implemented methodology and the need to adhere to relevant legislative frameworks and specific competences of the corresponding level of government.

This study provides valuable insights into the effectiveness of behavioural interventions in the context of local government, highlighting the importance of carefully designed and implemented interventions and the need for further exploration of the factors that influence households' compliance behaviour.

## Appendix A. The share of non-compliers with the payment of taxes and fees in the city of Hlohovec, Slovakia

**Table A1. The share of non-compliers with the payment of individual taxes and fees in the city of Hlohovec**

Year	Indicator	Property tax	Dog upkeep tax	Hotel accommodation tax	Vending machine tax	Garbage collection fee (natural persons)	Garbage collection fee (legal entities)
2018	Number of taxpayers	8,581	1,468	10	3	9,778	699
	Number of non-compliers	58	23	1	1	687	35
	Share of non-compliers (%)	0.67	1.57	–	–	7.3	5.01
2019	Number of taxpayers	8,512	1,491	10	3	10,194	706
	Number of non-compliers	66	38	0	0	1172	132
	Share of non-compliers (%)	0.77	2.55	–	–	11.5	18.7
2020	Number of taxpayers	8,575	1,460	5	2	10,137	676
	Number of non-compliers	683	148	2	1	2,980	303
	Share of non-compliers (%)	8	10.14	–	–	29.4	44.82
2021	Number of taxpayers	8,540	1,477	4	2	10,247	683
	Number of non-compliers	386	36	1	1	2,831	351
	Share of non-compliers (%)	4.52	2.43	–	–	27.63	51.39

Source: Data based on information provided by the municipality office of the city of Hlohovec.


**Table A2. Proportion of compliers in treatment and control groups across both periods**

	(1) Pre- intervention period	(2) Post- intervention period	(3) Number of ob- servations, <i>N</i>
Treatment group 1 (social norm leaflet)	0.9111	0.7635	1,721
Treatment group 2 (deterrence leaflet)	0.8929	0.7465	1,625
Control group	0.9191	0.7590	1,718

Source: own computations based on the data obtained from the experiment.

## Appendix B. Leaflets sent to households in intervention groups

The Deterrence Leaflet



The graphic for the Deterrence Leaflet features a dark blue background. In the top left corner is the Hlohovec logo, which consists of the letters 'HLO', 'HO', and 'VEC' stacked vertically next to a white arrow pointing to the right. Centered below the logo is a large, stylized red trash bin with a handle and three vertical ridges.

**Pay the garbage fee within the given deadline and avoid an executive order!**

**If you do not pay the garbage fee within the given deadline, you may be put under enforcement proceedings!**

The Social Norm Leaflet



The graphic for the Social Norm Leaflet features a dark blue background. It displays ten stylized human figures arranged in two rows of five. The top row contains five blue figures, and the bottom row contains four blue figures followed by one white figure, representing a 9:1 ratio of payers to non-payers.

**JOIN THE PAYING MAJORITY!**

**Did you know that 9 out of 10 citizens of Hlohovec pay garbage fee on time? Become a part of PAYING MAJORITY and pay the garbage fee within the given deadline!**



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