

Incentives, rules and perceptions – an experimental approach to changing perceptions

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Introduction

It is well known that the effective enforcement of traffic laws is critical for improved road safety outcomes (see Wali et al., 2017: 272). Decisions to follow traffic rules and pay fines are influenced both by formal institutions (e.g. laws, court summons, and fines) and informal institutions (e.g. norms and aspects of culture). Formal and informal institutions create incentives that should be designed to steer individuals' behaviour towards desired outcomes. Unfortunately, there is no reason to believe that the incentives around traffic violations currently in place in South Africa are generally efficient. Violations of traffic laws have long been prosecuted via the criminal justice system, but enforcement has been rated at largely ineffective (WHO 2018: 235). The majority of transgressors ignore fines without suffering consequences, even though the extant incentive structures (such as penalties and fines) are similar to those of other countries. As a consequence, South Africa ranks in the bottom 25% worldwide for road fatalities per 100 000 of the population, despite more positive socio-economic indicators.

South Africa apparently exhibits a disjunction between the actual behaviour of road users and that envisaged by lawmakers, caused at least in part by the severely blunted capacity of sanctions to disincentivise violations of traffic laws. As a result, there has been growing interest from the traffic authorities to find better ways of ensuring the payment of fines and altering behaviour. This has culminated in the recent passage of the Administrative Adjudication of Road Traffic Offences (AARTO). AARTO introduces, among other things, financial incentives to encourage voluntary payment of traffic fines in the form of a discount of 50% for timely settlement.

This paper discusses the findings of a controlled laboratory experiment that tested the efficacy of different financial incentives which may influence the payment of traffic fines. An early payment discount similar to the incentive under AARTO was compared to a late payment penalty (used in other countries, like for instance some states in the USA), and to the absence of any incentives. Furthermore, we examined whether the willingness to settle fines is sensitive to the likelihood of enforcement by the authorities. We found that introducing financial incentives significantly increases voluntary payment of fines, irrespective of whether immediate payment is encouraged with a discount or late payment is discouraged with a surcharge. In addition, subjects are more sensitive to the likelihood of enforcement when financial incentives are present.

The questionnaire that accompanied the experiment also revealed some of the informal incentives that affect payment (for instance, the subjects strongly believe that nobody else pays fines), and also indicated that the subjects seem to be receptive in principle to formal incentives such as the suspension of licenses.

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Incentives in Public Policy

The aim of many public policies is to incentivise specific kinds of behaviour, reflecting a strong belief in the ability of rewards and sanctions to mould behaviour. Economists have long assumed that the preferences of economic agents are rational and based on self-regarding utility-maximisation (Aaron, 1994: 8). In addition, these preferences and the values, norms, and habits of which they are reflections, were taken as given and beyond analysis and the reach of public policy (Aaron, 1994: 4). As a result, economists have traditionally focussed almost exclusively on material (usually monetary) incentives.

Over the past two decades, however, economists have come to realise how complex human motivation and behaviour are and the importance this realisation for the efficacy of incentives. A considerable and growing body of evidence has shown that people are motivated by both material and immaterial incentives. Furthermore, the effects of material incentives depend on how they are designed, the form in which they are given, how they interact with immaterial incentives such as intrinsic and social motivations, and what happens after they are withdrawn. For example, monetary incentives can sometimes crowd out intrinsic motivation and actually discourage desired behaviour (Gneezy, 2000). The ambiguous nature of incentives is emphasized by the following quote from Bowles and Polania-Reyes (2012: 369): “Incentives work, often affecting the targeted behaviour almost exactly as conventional economic theory predicts ... But explicit economic incentives sometimes have surprisingly limited effects, and may even be counterproductive.” So incentives do matter, but in various and sometimes unexpected ways.

Incentives in society are provided by institutions and vary by the manner in which these institutions are enforced. Voigt (2018: 146), for example, classifies institutions by the way they are sanctioned (see Table 1). An institution is “external” if the state sanctions rule-breaking, and “internal” if members of society sanction rule-breaking. External institutions typically provide material incentives (e.g., fines). Internal institutions can sometimes also provide material incentives when enforcement is private and informal (e.g., by shunning), but more commonly create immaterial incentives through conventions and social norms. For the enforcement of traffic policy, both internal and external enforcement are arguably at play: people obey traffic laws not only because they will be sanctioned if they do not, but also because it is conventional, ethical (not to endanger other road users), and/or customary to obey laws. State legislation need to become operative only if these internal institutions are in conflict with the laws of the country. Du Plessis et al. (2019) highlight that ideally, traffic laws should be internally enforced, as it is impossible (and unpleasant) to formally enforce all rules all the time.

Table 1 Types of internal and external institutions

Kind of Rule	Kind of Enforcement	Type of Institution
Convention	Self-enforcing	Type 1 internal
Social norm	Self-commitment of the actor	Type 2 internal
Social norm	Via informal societal control	Type 3 internal
Private rule	Organised private enforcement	Type 4 internal
State Law	Organised state enforcement	External

Source: Voigt 2018: 146

Internal and external institution should not be seen as substitutes, however. Weak external enforcement can undermine social norms and erode them. Likewise, strong external institutions can reinforce conventions. For example, information and persuasion campaigns aimed at changing public perceptions and norms are often ineffective on their own (Avineri & Goodwin, 2010, Nævestad, et al., 2014).

Our experiment investigates two aspects of internal enforcement: Are people more receptive to financial incentives when they are presented positively as a discount, or negatively by means of penalty? Although the material consequences of receiving a discount for early payment or a penalty for late payment are essentially the same, the different framing may have psychological effects that results in different rates of compliance. We know, for example, that calling the same economic game either “Community Game” or “Wall-Street Game” significantly changes how pro-socially people play (Lieberman et al., 2004). However, it turns out that introducing a penalty instead of a discount does not make our subjects less likely to settle their fines voluntarily.

The second dimension we examine is whether increasing the rate of enforcement has positive effects on compliance even in the absence of financial incentives and whether such effects are enhanced when financial incentives are added. Here we find positive evidence for both the former and the latter, suggesting that financial incentives and higher enforcement rates complement each other. Seemingly paradoxically, with financial incentives in place, intensifying enforcement can actually lead to relief for the administrative system.

Road traffic safety and policy – globally and in South Africa

This section provides a brief overview of the general traffic problems in South Africa and the country’s current traffic policy environment.

The current traffic situation

In 2016 there were 1.35 million road traffic fatalities worldwide. Low- and middle-income countries disproportionately (93%) carried the greater share of these deaths, and even though they accounted for more than 85% of the global population, they had only 60% of global registered vehicles (WHO, 2018: 7). A comparison of fatalities per 100 000 of population shows that low-income countries in Africa (with a rate of 29.3) have a much higher risk compared with middle-income countries in Europe (14.4). In fact, according to the WHO (2018: 7), low-income countries have not experienced a decline in fatalities since 2013, whilst there was a reduction in road traffic deaths in 48 middle- and high-income countries.

South Africa is well known for its high number of road fatalities. The WHO (2018: 235) reported that the country’s fatalities per 100 000 of population in 2016 was 25.9. In that year there were 11 676 fatal crashes in total, of which the greatest proportion occurred in the provinces of Gauteng and Kwazulu-Natal (RTMC, 2017: 14). Approximately 21% of these crashes were ascribed to single vehicles that overturned (RTMC, 2017: 17). The literature on the causes of these fatalities emphasises the influence of alcohol and speeding (Wesson et al., 2016: 1). Verster and Fourie (2018: 5) investigated the 2015 road fatality statistics and ascribed approximately 80% of them to human factors, i.e., characteristics and behaviour of the road users (driver, occupants of the car/s, pedestrians and other road users). More than half of such incidents were caused by jaywalking and approximately 13% were caused by speeding. These road safety problems come at a great cost to the country. An estimation for 2015 revealed that road crashes cost the country 3.4% of GDP (RTMC, 2016: 36), of which fatalities comprised the largest proportion.

The traffic institutional environment

The Constitution (Act 108 of 1996, as amended) of South Africa assigns responsibility for traffic legislation and its implementation to the three spheres of government (national, provincial, and local), who either share concurrent responsibility for road traffic regulation or have exclusive powers over

roads and traffic. South Africa has several legislative acts pertaining to road traffic – such as The National Road Traffic Act (Act 93 of 1996) and The National Road Traffic Regulations, 2000 (Justice Project South Africa, 2019) – which are administrated through the Criminal Procedure Act (No 51 of 1977). The major problem with this system is its ineffectiveness in enforcing traffic regulation. Many traffic infringements are not considered by the courts, and fines are inefficiently collected or not paid at all (AARTO Background, undated).

The most recent bill, which has been approved but awaits implementation, is a demerit system called AARTO (The Administrative Adjudication of Road Traffic Offences). The AARTO system has been established to increase the efficacy of adjudicating traffic infringements and to alleviate the burden of the court system - except for serious offences, there is no longer the option to appear in court (AARTO, undated). When implemented, the system will have admission of guilt fines in conjunction with penalty points. A great advantage will be that the fines will be set by the National Department of Transport and uniformly applied throughout the country – the public prosecutor will no longer have the power to reduce fines. If the fine is paid within 30 days, a discount of 50% will apply, similar to the one option that were tested in the experiment. However, the AARTO demerit system has not been formally implemented yet (even though the Act was signed into law in 2019), and a pertinent question is whether the AARTO will have a significant impact on altering the behaviour of traffic transgressors.

Speeding and policy interventions

Speeding is one of the major contributing factors to road safety problems globally. According to the WHO (2017: 5), excessive speed is a problem in all countries, and it is a core factor contributing to road accidents. In OECD countries almost 50% of drivers regularly exceed the speed limits, and in the UK, speeding is responsible for 28% of road crashes (WHO, 2017: 5). South Africa is one of the countries on the African continent with substantial problems of excessive speed (see Bester & Geldenhuys, 2007). Statistics from road traffic infringements in Cape Town reveal that approximately 69% of all traffic transgressions over the period July 2014 to July 2016 could be attributed to ten main transgressions, of which seven were speed related (Du Plessis, et al. 2019: 12).

Reducing excessive speed was listed as one of the voluntary global performance targets for road safety risk factors and service delivery mechanisms by the member states of the United Nations in 2017 (WHO, 2018: 19). The target is to halve the proportion of cars exceeding speed limits, and to reduce the injuries and fatalities related to excessive speed. Various approaches are adopted to reduce speeding, such as building or modifying road infrastructure (e.g. speed bumps) or increasing awareness of the dangers associated with speed (WHO, 2017: 7). According to the WHO (2015: 21), most countries have speed limits: 97 of the 180 participating countries set maximum speed limits of 50 km/h in urban areas (in line with best practice) (WHO, 2015: 22). To be effective though, these regulations must be enforced. This is hardly taking place, however. According to the WHO (2015: 22), only 15% of participating countries rated their enforcement of speed limits as good (a score of 8 or above on a scale of 0 to 10).

According to the WHO (2017: 10), the enforcement of speed limits is only effective if the consequences of violating these limits (such as financial penalties or a demerit system) are clearly spelt out in related legislation and regulations. However, it is then assumed that these laws and regulations are enforced effectively. South Africa had a relatively low score of 3 (out of 10) in 2015 for speeding enforcement (although this score has increased to 6 in 2018 – see WHO, 2018: 330). Du Plessis, et al. (2019: 16) point out that speeding may be one of the traffic offences that is easier to detect (through, for example, fixed or portable cameras). However, very few of these fines are actually paid. Statistics on the City of Cape Town's traffic infringements revealed that during the period July 2014 to July 2016, only 26% of

all traffic fines were paid, and even though speed-related fines were relatively better paid compared to the other traffic offences, the extent of non-payment had a profound diminished effect on the efficacy of a penalty system to deter traffic violations (Du Plessis, et al. 2019: 16).

One possible explanation for the ineffectiveness of traffic fines in reducing violations is non-salience: transgressors are not immediately aware of the fine as it takes time to process and deliver it; hence it is not linked to the offence in a timely manner. Several features of the current system in South Africa enhances the inefficacy of the penalty system: citizens know that they can apply for a reduction in the fine amount, which mitigates the effectiveness of the fine system. Furthermore, since the fine may be perceived as a financial loss that occurs at a future date, drivers may place a higher utility on speeding (i.e. a case of present bias). Finally, the collective conformity bias works against the payment of traffic fines if citizens are aware that other citizens do not pay their fines and that the enforcement is not stringent. Hence, to improve the efficacy of the penalty system, enforcement must be improved.

There is an expectation that the new administrative system AARTO³ will improve the enforcement of traffic legislation as the rules regarding penalties will be known and universally applied. AARTO will change the administrative rules, but not the detection and deterrence of traffic transgressions (such as more speed cameras or increased visible policing). AARTO will increase the cost of transgressing by way of demerit points which could result in the transgressor losing his/her driver's licence. Without improved detection of traffic violations, though, people may be tempted to drive without a licence. However, a US study has shown that speeding tickets were less effective in reducing repeat transgressions, and that the severity of the penalty can affect the risk of recidivism (Lawpoolsri, 2007: 26). The study highlighted that a penalty of fines and probation before judgement reduced the risk of repeating transgressions (compared to those facing no legal consequences), but a fine with a (demerit) point system did not significant affect the risk of repeat citations (Lawpoolsri, 2007: 32).

If the informal institutions are not altered, the change in formal institutions (AARTO) will have very little effect and might go the same route as the recently failed attempt to implement an electronic toll system (E-Toll), which was abandoned at great cost to government after it became clear that they could not enforce the payment. Over time traffic offenders have become accustomed to the fact that their offences have very limited consequences. For this reason, it is imperative to consider alternative mechanisms that provide incentives to change the perceptions of offenders. The remainder of this paper focuses on these types of incentives. The aim is to identify incentives that work with, and not against, the informal institutions of drivers.

Traffic experiment⁴

This experiment simulated alternative traffic fine incentive structures and evaluated responses, to determine the efficacy of altering the formal institutions governing traffic offenders. In the experiment we test for the effects of increased enforcement and different financial incentives.

Experimental design

In this experiment, subjects play six rounds of a simple decision-making game. In each round, they start with an endowment of R200 and then engage in a real-effort slider task (as in Gill & Prowse, 2012) for 60 seconds to earn additional funds. They receive an additional R50 for each 3 sliders solved up to a

³ AARTO has been under consideration for more than a decade, and it was only recently passed into law.

⁴ A Social Impact Grant received from the Faculty of Economics and Management Sciences, Stellenbosch University, made this experiment possible.

maximum of R200 extra endowment. Next, subjects are told that they were caught speeding and have been fined R100. They can choose whether to pay the fine immediately or not, which is taken from their endowment. In the treatment DISCOUNT, if they decide to pay, their fine is reduced to R50. If they do not pay the fine immediately, there is a 50% (LOW SUMMON) or 80% (HIGH SUMMON) probability that they will be “summoned by the court”. Upon being summoned, subjects have to pay their fine of R100 and in the treatment PENALTY, another R100 as a late payment penalty. If a subject is not summoned, they do not have to pay the fine.

All treatment variations are within-subject, but the treatment variations DISCOUNT and PENALTY do not occur together. As a result, we have a 2x3 design with 6 different combinations. The treatment variations are also summarised in Table 2.

Table 2: Treatment summary

Endowment	R200 – R400		
	DISCOUNT	PENALTY	NONE
Fine paid immediately	-R50	-R100	-R100
Fine not paid & summoned	-R100	-R200	-R100
Fine not paid & not summoned	-R0	-R0	-R0
	LOW SUMMON	HIGH SUMMON	
Probability of being summoned	50%	80%	

In total, 218 subjects in 5 sessions participated in the experiment at the FHARGA (computer centre) at Stellenbosch University⁵. Subjects were recruited via email and posters. The experiment was programmed in zTree (Fischbacher, 2007). A session lasted approximately 60 minutes. After reading written instructions, subjects played one practice round, followed by six main rounds, with a counterbalanced treatment order. At the end of the experiment, one of the six main rounds was randomly selected and paid out. On average, subjects earned R228.44 (min R50, max R400) plus a show-up fee of R50.

Theoretical considerations

To form hypotheses about behaviour in the experiment, we consider the predicted behaviour of the standard economic decision maker who is materially self-interested and rational (“homo economicus”) and contrast it with potential behavioural deviations. We skip detailed calculations of expected payoffs and expected utility where they are trivial.

In the NONE treatment, there is no downside to not paying the fine immediately. Hence a homo economicus should never pay the fine voluntarily, irrespective of endowment, summoning probability, or risk preferences. This yields our first hypothesis:

H_{1a}: In the NONE treatment, voluntary payment of the fine does not occur.

⁵ Ethical clearance was granted by Stellenbosch University (Project number: ECO-2019-9241)

If some decision makers are intrinsically motivated to pay the fine voluntarily because they consider it a social norm to do so, we should see some level of voluntary payments. If this intrinsic motivation is sensitive to how likely non-compliance is prosecuted, voluntary payments should increase when the summoning probability is high.

H_{1b}: In the NONE treatment, some voluntary payment occurs and it occurs more often in HIGH SUMMON than in LOW SUMMON.

In DISCOUNT and PENALTY, risk-neutral standard decision makers are indifferent between paying the fine immediately when the summon probability is 50%. They prefer to pay immediately when the probability of being summoned is 80%. When decision makers are risk-averse, they always prefer to pay the fine immediately. Assuming the population consists of a mixture of risk-neutral and risk-averse individuals, these considerations give us our next hypothesis:

H_{2a}: In DISCOUNT and PENALTY, the rate of voluntary payment is high in LOW SUMMON and is 100% in HIGH SUMMON.

Just like some decision makers may be intrinsically motivated to pay the fine voluntarily, others may be intrinsically reluctant to pay. Although it is in principle conceivable that individuals are so deviant that increasing the summoning probability further discourages them from paying their fines, it seems more probable that there exists a synergy between financial incentives and summoning probability on the intrinsic willingness to pay the fine. Both interventions signal that settling the fine voluntarily is the normatively correct behaviour and so the two signals may complement each other.

H_{2b}: In DISCOUNT and PENALTY, the difference in voluntary payment rate between LOW SUMMON and HIGH SUMMON is greater than in NONE.

Whether the immediate repayment is halved (DISCOUNT) or the late fine is doubled (PENALTY) makes no difference for the expected payoff when the summon probability is 50%. When the summon probability is 80%, paying voluntarily is the strictly preferred choice for risk-neutral and risk-averse standard decision makers. So the homo economicus should make identical decisions in DISCOUNT and PENALTY.

H_{3a}: Subjects' decisions in PENALTY are the same as those in DISCOUNT.

Granting a discount is a kinder, more positive intervention than imposing a penalty. Given that many people have preference for reciprocity, intrinsic motivation to settle the fine voluntarily should therefore be higher in DISCOUNT than in PENALTY.

H_{3b}: Subjects are more likely to pay their fine voluntarily in DISCOUNT than in PENALTY.

Results of the experiment

In treatment NONE, i.e., without an early payment discount and a late payment penalty, the fine was paid immediately in only 11.9% of the decisions. In contrast, with an early payment discount and a late payment penalty, the share of immediate payments rose to 76.1% and 80.3%, respectively. On aggregate across all three treatments (NONE, DISCOUNT, PENALTY), the share of immediate payments

increased from 48.7% to 61.5% when the probability of being summoned increased from 0.5 to 0.8.⁶ Table 3 provides a summary these results and a breakdown of them over the treatments.

Table 3: Share of immediate payments

N = 218	NONE	DISCOUNT	PENALTY	TOTAL
Summon prob. 0.5	7.8%	63.8%	69.7%	47.1%
Summon prob. 0.8	16.1%	88.5%	90.8%	65.1%.
Total	11.9%	76.1%	80.3%	

Although the results do not exactly confirm the hypotheses H_{1a} and H_{2a} of the standard model, they are nevertheless largely in line with them. Voluntary payment is rare in NONE and common in DISCOUNT and PENALTY. However, we also find evidence for hypothesis H_{1b} as the share of voluntary settlement in NONE more than doubles going from LOW SUMMON and HIGH SUMMON despite non-payment being the dominant choice in both cases. Compliance rates between DISCOUNT and PENALTY are very similar with seemingly no evidence of any framing effects.

To examine the results further, we conduct a random-effects panel logit regression. The results are reported in Table 4. Model (1) confirms the results from the summary statistics. Subjects were significantly more likely to pay their fine immediately if either an early payment discount or a late payment fine was in place. Consistent with hypothesis H_{3a} but not H_{3b} , we cannot reject the assumption that the coefficients of DISCOUNT and PENALTY are equal (Wald-test, $p = 0.1$). If anything, subjects are slightly more likely to pay in PENALTY than in DISCOUNT. In support of H_{1b} , increasing the probability of being summoned also significantly increases the likelihood that the fine is paid voluntarily. However, the coefficient is noticeably smaller than those of DISCOUNT and PENALTY (Wald-test, $p < 0.001$), respectively, suggesting that the financial incentives have a much stronger effect than any non-monetary motivations (although such comparisons should be treated cautiously).

Model (2) includes subjects' endowments to examine whether there were any income effects on payment decisions and on the round played to check for any learning effects or trends. However, the coefficients of endowment and round are both not statistically different from 0, suggesting that it does not matter whether subjects earned more or less in the real effort task, nor do their behaviour change over time.

In model (3), we break down the effect of high probability of being summoned by interacting the dummy variable for HIGH SUMMON with the treatment dummy of NONE. The results show that increasing the probability of being summoned has a weaker effect on its own compared to when paired with financial incentives, supporting hypothesis H_{2b} . Model (4) uses the interaction with PENALTY and DISCOUNT instead, but the two coefficients are very similar.

⁶ Oddly, increasing the probability of being summoned even has an effect on voluntary payment when there are no monetary incentives to pay (NONE). These instance are likely mistakes, consistent with the assumption that mistakes become more likely as the costs of making them decrease.

Table 4: Determinants of immediate payment of fine

Dependent variable: Immediate payment of fine	(1)	(2)	(3)	(4)
Early Payment Discount	4.047*** (.263)	4.044*** (.263)	3.589*** (.331)	3.582*** (.336)
Late Payment Fine	4.349*** (.274)	4.346*** (.274)	3.897*** (.337)	3.905*** (.344)
High Probability of Summon	1.501*** (.178)	1.500*** (.178)	1.699*** (.208)	0.917*** (.332)
--- DISCOUNT				0.805* (.430)
--- PENALTY				0.756* (.444)
--- NONE			-0.782** (.388)	
Endowment (in R100)		0.0658 (.164)		
Round		0.031 (.048)		
Constant	-3.286*** (.245)	-3.593*** (.557)	-2.891*** (.294)	-2.891*** (.294)
N	218	218	218	218

Note: The table reports results from random effects logit regressions. Standard errors are in parentheses;
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Policy implications and conclusion

The results of the experiment suggest that increasing the frequency of summons by the courts will have a positive, although fairly limited, effect on compliance by traffic offenders. This is not surprising since there are no financial downsides to waiting to see whether one will be summoned by the court. That we still see an effect, however, is indicative of some subjects being intrinsically motivated to follow the perceived social norm of paying one's fines on time.

Although in real life, there is the additional inconvenience of having to actually appear in court if summoned, the observed low compliance rate indicates that this alone does not sufficiently encourage most people to settle fines voluntarily. Furthermore, increasing the frequency of summons would only further clog up the court system with relative trivial traffic offenses.

Instead, modifying the financial incentives promises to motivate a much larger share of transgressors to pay their fines on time. Rewarding voluntary compliance with a discount or penalising non-compliance with a higher fine appears to yield comparable results, so the decision between both options could potentially be based on other considerations. For example, penalising non-compliance

yields higher revenue for the administration, whereas citizens will arguably receive rewards for voluntary compliance more favourably politically, even if we do not find an effect on compliance in the experiment.

The results also suggest that combining financial incentives with an initiative to increase the enforcement rate may yield a positive effect on compliance that exceeds the sum of both isolated effects. This, too, points to the existence of intrinsic motivation that is sensitive to signals about normative behaviour. On top of that, with financial incentives in place, it may even be possible to further decrease the workload of the courts by increasing the frequency of summons. This may sound contradictory but consider the following numerical example from the experiment. With the late payment fine active, compliance increased from 69.7% to 90.8% when the probability of being summoned increased from 50% to 80%. This lowered the share of subjects summoned from 15.15% (50% of 30.3%) to 7.36% (80% of 9.2%). A similar decrease occurred with the early payment discount (from 18.1% to 9.2%).

We must stress that our study addresses only the narrow question of compliance. In the experiment, subjects could only adjust their decision about whether or not to pay their fine immediately. In real life, changing the financial incentives might have further, possibly unintended, consequences. For example, if (some) drivers essentially perceive speeding fines as the price of driving fast (like for instance the experiment of Gneezy & Rustichini (2000) with late-coming parents at a crèche), providing an early payment discount effectively makes speeding cheaper. As a result, these drivers will “buy” more of it, potentially leading to an increase in overall traffic violations and fatalities. Furthermore, while we found no effect on compliance, it is possible that the discount/penalty framing may matter for transgressions. For example, giving a discount on speeding fines may send the message that speeding is a “forgivable” minor offence, whereas a penalty may enhance the perception that speeding is morally wrong.

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Appendix:

A.1

Assume risk-averse player i has the concave utility function U_i . Because of concavity, $U_i(-50) > (1-p) U_i(0) + p U_i(-100)$ and $U_i(-100) > (1-p) U_i(0) + p U_i(-200)$ for all $p \geq 0.5$, so player i prefers to pay the fine immediately in DISCOUNT and PENALTY, respectively.

Furthermore, the difference between $U_i(-200)$ and $U_i(-100)$ is more than twice as large as the difference between $U_i(-100)$ and $U_i(-50)$, also because of concavity. It follows that the difference in utility between choosing the immediate payment and not paying voluntarily is larger in PENALTY since

$$\begin{aligned} U_i(-50) - (1-p) U_i(0) - p U_i(-100) &< U_i(-100) - (1-p) U_i(0) - p U_i(-200) \\ \Leftrightarrow U_i(-100) - U_i(-50) &< p (U_i(-200) - U_i(-100)) \end{aligned}$$

is true for all $p \geq 0.5$. Hence, choosing not to pay the fine immediately is more costly in PENALTY than in DISCOUNT when players are risk-averse.

A.2 Demographics of experiment participants

