



# **Taxpayers' behavioural responses to Voluntary Disclosure Programmes: evidence from South Africa**

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# Taxpayers' behavioural responses to Voluntary Disclosure Programmes: evidence from South Africa

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## Abstract

South Africa, like any other country, strives towards greater tax revenue mobilisation. One possible explanation to low revenue levels is non-compliance by taxpayers. Given its implications for the provision of public goods and services, the government has instituted various enforcement measures, including (among others) reprieves (amnesties and voluntary disclosure programmes) to delinquents who voluntarily disclose their previously unreported income. However, evidence on the efficacy of these measures show mixed responses in developed countries, making it imperative to analyse these policy measures in more depth for developing countries. Against this background, we examined taxpayers' behavioural responses to once-off and permanent voluntary disclosure programmes. Using laboratory experiments, we found that both once-off and permanent voluntary disclosure programmes are effective in increasing compliance in the short-term, and only when they are accompanied by increased enforcement measures. The results also show that both once-off and permanent voluntary disclosure programmes (with or without increased enforcement) have insignificant long-term effects on compliance. Furthermore, a once-off voluntary disclosure programme is more effective than a permanent voluntary disclosure programme in stimulating compliance. As such, it is recommended that authorities avoid permanent voluntary disclosure programmes.

**Keywords:** Voluntary Disclosure Programme; tax reprieve; compliance; tax evasion; laboratory experiment; taxpayers; compliance

**JEL Codes:** C91, H26

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# 1 Introduction

To improve tax compliance, many governments across the world use measures that complement traditional enforcement mechanisms (such as audits and penalties). One such measure is a tax reprieve, whereby delinquent taxpayers are given an opportunity to rectify their tax status at no (or reduced) penalties associated with non-compliance. Notably, there has been a proliferation of tax reprieves across Africa countries (such as Kenya, Namibia, Nigeria, Zimbabwe and South Africa) over the past years. However, the typology of these reprieves vary: some are once-off (temporary), while others are open-ended (permanent). In some instances, a reprieve may target a specific type of tax offence, while others may target a specific type of tax (López-V & Rodrigo, 2003: 74).

There are two forms of tax reprieves: an amnesty and a Voluntary Disclosure Programme (VDP) (Baer & Borgne, 2008: 29). Under a typical amnesty, delinquent taxpayers who voluntarily disclose their previously unpaid taxes are allowed to enter the tax net without paying both the tax owed and the penalties that are associated with non-compliance (OECD, 2015: 14). In contrast, in a VDP regime, taxpayers are still liable to settle their heretofore unpaid taxes at no - or reduced - penalties associated with non-compliance (Baer & Borgne, 2008; OECD, 2015). Despite the technical difference between typical amnesties and VDPs, VDPs are sometimes loosely referred to as ‘amnesties’, as they provide an amnesty on penalties (see e.g. ZRA, 2017; ZIMRA, 2018a). Nonetheless, VDPs are becoming more popular than typical amnesties; they provide governments with the opportunity to raise some immediate revenue as taxpayers would be required to pay the tax owed.

Despite their wide adoption, empirical evidence on the effects of tax reprieves on compliance is inconclusive. For instance, some (e.g. Leonard & Zeckhauser, 1987; Fisher, Goddeeris & Young, 1989; Torgler, 2003) argued that reprieves motivate delinquent taxpayers to increase their compliance in future, as it would no longer be necessary to hide their past bad behaviour. It was further argued that tax delinquents (especially those who evade unintentionally) might feel guilt for evading taxes, which constitute a grief (psychological loss) Torgler & Schaltegger (2005: 416) pointed out that a reprieve might therefore provide taxpayers with the opportunity to rectify their tax status and reduce (or avoid) the psychological costs associated with non-compliance. On the other hand, Alm & Beck (1991), Andreoni (1991) and Luitel & Sobel (2007) argued that reprieves undermined taxpayers’ morale, which led to a decline in future compliance. Furthermore, some (e.g. López-V & Rodrigo, 2003; Alm, Martinez & Wallace, 2009) pointed out that reprieves were of no effect on compliance.

In light of the foregoing discussion, it is evident that the efficacy of tax reprieves is debatable. However, existing evidence on the efficacy of tax reprieves is based largely on temporary amnesties drawn from developed-country applications, implying that there is limited evidence on the efficacy of tax reprieves on compliance from a developing-country perspective. In spite of this, tax reprieves (both temporary and permanent) have been common compliance-enhancement instruments in South Africa, making it imperative to investigate the efficacy of

this policy instrument. It is against this backdrop that we employed a laboratory experiment to investigate the short- and long-term effects of temporary and permanent VDPs on non-salaried income compliance in South Africa.

The rest of this paper is structured as follows: Section 2 discusses the theoretical arguments on tax reprieves. Section 3 discusses findings from existing literature on the efficacy of tax reprieves. Section 4 provides an overview on tax reprieves in South Africa. Section 5 discusses the methodological approach that was used in this study. Section 6 outlines and discusses the results of the study, and Section 7 concludes.

## 2 Theoretical considerations

Taxpayer behaviour can be examined under two different frameworks: the economic deterrence and behavioural theories. The economic deterrence approach to tax evasion posits that taxpayers' would evade whenever the economic benefit of evasion outweighs the benefit of paying taxes (Allingham & Sandmo, 1972; Sandmo, 2005). Behavioural (or non-deterrence) theory, in contrast, argues that taxpayers' behaviour may be influenced by non-economic factors such as altruism, reciprocity, fairness, guilt and shame (Erard & Feinstein, 1994; Torgler, 2003; Torgler & Schaltegger, 2005). For instance, Erard & Feinstein (1994: 75) pointed out that if citizens regard paying taxes as a civic duty, failure to pay their tax obligations in full may instil a feeling of guilt and shame to the delinquent, which are psychological costs. As such, taxpayers may need to comply with the tax requirements to avoid these costs. Delinquents may also be willing to rectify their tax status to reduce the psychological costs but may be hindered by the fear of being punished or embarrassed, making it necessary for the authorities to provide reprieves (amnesties and VDPs) to those who voluntarily declare their unpaid taxes. Torgler & Schaltegger (2005: 416) argued that reprieves might therefore provide taxpayers with the opportunity to rectify their tax status and reduce (or avoid) the psychological costs associated with non-compliance. Fisher *et al.* (1989) highlighted that tax reprieves were usually implemented to convince delinquent taxpayers that the probability of detection (together with penalties) would soon be increased, and that tax evasion was morally wrong. This sought to increase the psychological costs associated with non-compliance. Tax reprieves were therefore used to complement the traditional enforcement instruments (audits and penalties) and they sought to stimulate voluntary compliance (Fisher *et al.*, 1989: 16).

The following is an illustration of how a tax reprieve may influence tax compliance (see Alm & Martinez (2003) and Torgler & Schaltegger (2005)). A large group of individuals is assumed to have received a fixed amount of income ( $Y$ ) each, which is supposed to be declared to the tax authority for tax purposes. Tax is paid on declared income ( $X$ ) at tax rate  $t$  (where  $X$  is less or equal to  $Y$ ). Although unreported income is not taxed, there is the probability that unreported income will be detected through an audit. The probability of an audit is  $p$  (which lies between 0 and 1). If the unreported income is detected,

the delinquent pays a fine ( $\alpha$ ), which is calculated as a multiple of unpaid taxes.

Thus:

If an individual is not audited, his income ( $I_{ua}$ ) is:

$$I_{ua} = Y_i - tX \quad (1)$$

If an individual is audited, his income ( $I_a$ ) is:

$$I_a = Y_i - tX_i - \alpha [t(Y_i - X_i)] \quad (2)$$

Suppose that an individual chooses to report  $X$  to maximise his expected value and that he is risk neutral. His expected value ( $EV$ ) from choosing to report  $X$  is:

$$EV_i = Y_i - tX_i - p\alpha [t(Y_i - X_i)] \quad (3)$$

Maximising equation 3 with respect to the reported income ( $X$ ) shows that the taxpayer optimally declares all the income if:

$$p\alpha > 1 \quad (4)$$

However, if  $p\alpha < 1$ , reporting zero income will be an optimal strategy.

Now, assume that taxpayers regard evasion as immoral, such that paying taxes is widely accepted and viewed as a social norm. Accordingly, individuals who pay less than their full taxes incur some psychological costs, resulting in a utility loss on unreported income. Under such circumstances, the delinquent taxpayer may be willing to rectify his tax affairs, but may be hindered by the fear of being punished and embarrassed, if given an opportunity. The introduction of a reprieve (e.g. a VDP) may provide the defaulter with an opportunity to enter the tax net voluntarily and reduce the psychological costs associated with non-compliance. More formally, the introduction of a reprieve transforms equation 3 as follows:

$$EV_i = Y_i - tX_i - p\alpha [t(Y_i - X_i)] - \phi t(Y_i - X_i) \quad (5)$$

Equation 5 shows that evading taxes may cause an individual to suffer some psychological loss in expected income, which is proportional to the evaded taxes,  $t(Y - X)$ . Thus, if a taxpayer increases the amount of undeclared income ( $Y - X$ ), he pays lower taxes but higher psychological costs (implying that there is a positive relationship between evasion and psychological losses). Succinctly,  $\phi$  can be interpreted as a measure of the amount of taxes that one has to pay to circumvent psychological loss. Alternatively,  $\phi$  may be interpreted to measure the taxpayer's willingness to pay taxes.

The inclusion of a reprieve into equation (3) transforms conditionality (4) to:

$$p\alpha + \phi > 1 \quad (6)$$

Concisely, conditions (4) and (6) exhibit that both economic factors (e.g. audits and penalties) and moral sentiments may influence compliance decisions. The introduction of a VDP would therefore be expected to increase taxpayers' willingness to pay taxes ( $\phi$ ), to avoid some psychological losses.

### 3 Empirical evidence on the efficacy of tax reprieves

Research on the nexus between tax reprieves and compliance is expanding, and findings from these studies are diverse. For instance, Luitel & Sobel (2007) found that a first-time tax amnesty increased revenue in the short-term, which was followed by long-term revenue losses. Alm & Beck (1993) established that the Colorado reprieve had no impact on the level and trend of tax collections. This was despite the fact that the Colorado tax authority increased the post-amnesty enforcement efforts. It was concluded that a typical amnesty seemed to be of no material effect, a finding that is contrary to that of Luitel & Sobel (2007). Alm & Beck (1993: 54), however, suggested that their findings were likely to have been affected by the lifespan of the amnesty, which was too short (the amnesty was valid for only two months, from 15 September to 15 November).

López-V & Rodrigo (2003) found that the Spanish tax amnesty of 1991 had no effect on compliance, both in the short- and long-term, findings that confirm those of Alm & Beck (1993). Alm, Martinez & Wallace (2009) examined the effect of several tax amnesties introduced by Russia in the 1990s and established that the amnesties had no demonstrable impact on revenue, both in the short- and long-term. Alm *et al.* (2009: 249) concluded that amnesties were ‘fiscal gimmicks’, which should be avoided. However, Torgler *et al.* (2003) established that an amnesty significantly increase tax compliance when citizens are involved in the introduction of the reprieve.

Saraçoğlu & Lu (2011) established that Turkish amnesties triggered taxpayers to anticipate another future reprieve, which dampened future compliance. Furthermore, in support of Alm *et al.* (1990), the study found that compliance increased when post-reprieve enforcement measures were increased. The study further highlighted that Turkish amnesties harmed the principle of justice, as honest taxpayers regarded the move as an unfair reward to tax defaulters. The study also found that an amnesty that is accompanied by weak enforcement of the tax law would not produce significant improvement in compliance, a finding that confirms that of Alm, Mckee & Beck (1990) who found that compliance increases if post-amnesty enforcement efforts are increased. However, these findings are contrary to that of Alm & Beck (1993), López-V & Rodrigo (2003) and Alm *et al.* (2009).

### 4 Tax reprieves in South Africa

Over the last few years the South African government instituted a series of reprieves to increase voluntary compliance and broaden the tax base. For instance, in 1995, the government provided persons who were not registered as taxpayers an opportunity to enter the tax net at no penalty. The reprieve was valid from 10 July to 31 October and was later extended to 31 January 1996. In 1996, a second amnesty was introduced through the Final Relief on Tax, Interest, Penalty and Additional Tax Act (SARS, 2016a: 417). This was meant to

give taxpayers additional time to comply with the requirements of the tax legislation. The reprieve window was valid from 1 November 1996 to 28 February 1997.

In 2003, the government introduced a joint amnesty, for exchange control and domestic tax, allowing people with undisclosed offshore income to correct their affairs. The reprieve was introduced through the Exchange Control Amnesty and Amendment of Taxation Laws Act of 2003, and was valid from 1 June to 30 November 2003. In 2006, the government introduced an amnesty to small businesses to voluntarily declare their unreported income and comply with the tax legislation (SARS, 2016a: 417). The relief was available from 1 August 2006 to 31 May 2007.

Subsequent to the aforementioned amnesties, the government introduced a series of VDPs to further encourage voluntary compliance and broaden the tax base. Importantly, unlike under in a typical amnesty where taxpayers are exempted from paying both the tax owed and any penalties associated with non-compliance, in a VDP regime taxpayers would still be required to pay the tax owed (Marino, 2015; Mastellone, 2015; OECD, 2015).

The first VDP was introduced in 2010 as a pilot project, running from 1 November 2010 to 31 October 2011. Those who voluntarily disclosed their previously unreported income were fully exempted from administrative penalties and criminal prosecution. The relief was available for all taxes that were under the administration of SARS, save for customs and excise duties, and also covered all forms of tax fraud. Importantly, the reprieve was available to both onshore- and offshore-income holders.

In 2012, the government re-introduced the VDP through an Act of Parliament, the Tax Administration Act 28 of 2011 (SARS, 2016a: 418). This was meant to provide non-compliant taxpayers with more time to rectify their tax affairs. The reprieve was effective from 1 October 2012 and will continue to be available for as long as the provisions were contained in the Tax Administration Act (SARS, 2016a: 418). In other words, the reprieve is open-ended (or permanent). Under this permanent VDP regime, taxpayers who voluntarily disclose their delinquencies would have their understatement penalties reduced. The magnitude of the relief is dependent on whether the disclosure is undertaken prior to or after the issuance of an audit notice by the tax authority.

In 2016, the government introduced the SVDP, a reprieve window specifically for taxpayers with undisclosed offshore income. The reprieve ran concurrently with the already existing (permanent) VDP (SARS, 2016b: 3). The scheme was valid for 11 months, from 1 October 2016 to 31 August 2017. Successful applicants were fully exempted from administrative penalties, under-statement penalties and criminal prosecution. The ‘special’ reprieve was meant to provide offshore income-holders an opportunity to rectify their tax status, pending an increase in enforcement, following the adoption of the Common Reporting Strategy (CRS)<sup>1</sup>. Thus, the adoption of the CRS ‘necessitated’ the introduction

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<sup>1</sup>The CRS is an inter-governmental model for automatic exchange of information whereby tax authorities are required to gather information from financial intermediaries from within

of the SVDP, alongside the already existing permanent VDP (SARS, 2016b: 3).

In light of the foregoing discussion, it is evident that the tax reprieves had been a common tax enforcement instrument in South Africa. However, empirical evidence on the effectiveness of reprieves are diverse. The diversity in empirical evidence might be due to (among others) the differences in the typology of these reprieves, as their designs vary from country to country. For instance, South Africa seems to be the only country that has a permanent reprieve window. Importantly, the empirical evidence on the effectiveness of reprieves have been drawn largely from developed country applications. There is, therefore, limited knowledge on the efficacy of reprieves (both temporary and permanent) on compliance, particularly from a developing country perspective.

Considering the wide application of VDPs in South Africa, it is essential to understand how these instruments influence compliance, both in the short-term and in the long-term. In light of this, this study sought to investigate the immediate (short-term) and future (long-term) effects of temporary and permanent VDPs on non-salaried income tax compliance in South Africa. Findings from this study may inform the authorities on how best to design and implement VDPs, which will improve compliance.

## 5 Methodological approach

This study employed a controlled laboratory experiment to investigate the immediate (short-term) and future (long-term) effects of VDPs on compliance. The experiment was conducted at Stellenbosch University with students drawn from different disciplines recruited via electronic invitations.

### 5.1 Experimental design

The experimental design was developed from those used by Torgler & Schaltegger (2005) and Alm *et al.* (1990). The experimental setting captured the essential features of the voluntary reporting system of South Africa's personal income tax (PIT). Subjects were randomly given some endowment, representing income that is non-salaried (e.g. self-employed income, rental income, capital gains, donations and investment income). The amount of income received was only known by its holder and was expected to be declared to the tax authority for tax purposes. Subjects were informed that they may keep their after-tax income at the end of the experiment.

Taxes were paid on reported income at a fixed rate of 30 percent<sup>2</sup>. Although their jurisdictions and exchange the information with other tax authorities across the globe, on an annual basis and/or upon request. This strategy put to an end the era of banking secrecy in tax matters.

<sup>2</sup>Over the past years, the majority (over 60%) of South Africa's individual taxpayers fall within the R70 000 - R350 000 taxable income band, and the majority of them are liable to a 30 percent tax rate (National Treasury and SARS, 2017: 104). There are also a number of studies (e.g. Alm, Mckee & Beck, 1990; Alm, Martinez & Wallace, 2009; Asnawi, 2016) that used this same tax rate. The 30 percent tax rate therefore allows findings from this study to

unreported income was not taxed, participants were subjected to random audits, which were meant to detect any misreporting; those audits were undertaken for the current and the previous three rounds. The previous rounds were audited to examine how taxpayers would disclose their previously unreported incomes, which is the main goal of any tax reprieve. The audits were determined by a virtual bingo cage that was displayed on the computer screen. The cage contained ten balls (red and white). These balls would bounce around for a while until one randomly popped out. If a red ball popped out, the subject would be audited. Conversely, a white ball popping out entailed that the subject would not be audited.

The probability of an audit ranged between 10 and 30 percent<sup>3</sup>, and any undeclared income was to be discovered in an audit, but only with some known and pre-announced detection rate, which was fixed at 50 percent<sup>4</sup>. Subjects were offered an opportunity to declare their previous unreported income voluntarily, and would pay the tax owed and a late-payment penalty, calculated as 25 percent of the late paid tax. If evaded taxes were detected through an audit, the evader paid the tax owed and a non-filing penalty, calculated at 50 percent of the detected taxes.

To encourage tax defaulters into rectifying their status, a VDP was introduced, allowing tax delinquents to declare their previously unreported income voluntarily, with no penalty for late payment. Although defaulters were exempted from paying the late-payment penalty, they were still liable to pay their heretofore unpaid taxes. As is the case in a non-VDP regime, the evader was liable to pay the non-filing penalty if the delinquency was detected by the tax authority.

The entire experimental exercise was computerised. Importantly, subjects were spaced in a computer laboratory to such an extent that they could not share information or access each other's information displayed on computer screens. Further, subjects were informed that the investigator would not be observing their compliance decisions. The investigator would therefore not be moving around the laboratory room during the exercise. These features were meant to crowd out any potential peer - and experimenter - effects that may confound subjects' behavioural responses (Alm, Deskins & McKee, 2006: 8). Subjects were also informed, through consent forms that their responses were anonymous.

The experimental exercise was context-rich. This helped subjects to contextualise the exercise, preventing them from regarding the experiment as a mere game. Contextualisation of the experimental setting improved the representation of the experimental environment to the real world tax system, helping the subjects to reveal behaviour similar to that obtained in the real world setting,

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be comparable with other studies'

<sup>3</sup>The South African audit probability is about 10 percent. The 10 percent - 30 percent range was meant to investigate taxpayers' behavioural responses when the audit rate is increased significantly.

<sup>4</sup>The low (i.e. 50%) detection rate reflected the productivity of audits on each non-salaried income (Alm *et al.*, 2009: 128).

thus making it possible to extrapolate the finding from the experiment to the real world (Torgler, Schaffner & Macintyre, 2009: 11).

Subjects were paid their earnings in cash at the end of the experiment. Their earnings were drawn from all rounds and were converted from laboratory currency (lab Rands) to South African currency (Rands) at the rate of lab R12 = R1. The subjects were provided with instruction sheets that explained how the earnings were determined. Furthermore, participants completed a demographic questionnaire at the end of the experiment. Information gathered from these questionnaires was essential in controlling for the demography of the subjects in econometric analyses. The demographic variables that were controlled for included gender, age, ethnicity, religion, work experiences, tax filing experience, academic discipline and level, family annual income level and marital status.

## 5.2 Experimental sessions

The experiment comprised of five sessions of 12 rounds each. Subjects were limited to only one session. Treatments were varied across sessions, allowing each session be a control for the other. Within sessions, the treatment was introduced in Round Seven to ensure that behavioural differences were controlled by allowing each subject be their own control. Parameters for the experiment are summarised in Table 2.

In Session One (the control session), no treatment was introduced, and the probability of an audit was fixed at 10 percent. In Session Two, a once-off VDP was introduced at the beginning of Round Seven, with all other parameters held at the same level as in Session One. This was meant to examine how taxpayers respond to a VDP in an environment where enforcement was not varied. In Session Three, a once-off VDP, accompanied by an increased audit rate of 30 percent, was introduced at the beginning of Round Seven. This treatment sought to explore taxpayers' behavioural responses to a VDP that was accompanied with an increased audit rate. Increased audit rates captured the aspect of increased enforcement and the ability to detect evasion by the tax authority (e.g. the implementation of the CRS). In Session Four, a permanent VDP was introduced in Round Seven, with all other enforcement parameters maintained at baseline-session levels. In Session Five, a permanent VDP was introduced in Round Seven and was accompanied by an audit rate of 30 percent. Importantly, a practice session of two rounds was undertaken before every session to ensure that participants fully understood the exercise.

## 5.3 Payoffs for the participants

- If the participant was not detected for underreporting, his accumulated earnings would be:

$Y - tX$ , where  $Y$  is the true income,  $X$  is the reported income, and  $t$  is the tax rate. From the afore-highlighted experimental setting, the after-tax earnings can be expressed as:

Actual income - 0.30\*(reported income).

- If the participant decided to declare back taxes voluntarily (i.e. without having been detected), his earning would be:

$Y - tX - lB$ , where  $l$  is the late payment penalty and  $B$  are the back taxes that are reported voluntarily, expressed as:

Actual income - 0.30\*(reported income) - 0.25\*(back taxes that is declared voluntarily).

- If the participant was detected for underreporting, he would pay the tax owed  $t(Y - X)$  plus the non-filing penalty  $t(f)(Y - X)$ , in addition to any late payment penalties, where  $f$  is the non-filing penalty rate. His accumulated earnings for a round would be:

$Y - tY - lB - t(1 + f)(Y - X)$ , and can be expressed as:

Actual income - 0.30\*(reported income) - 0.25\*(back taxes that is declared voluntarily) - 0.3\*1.5\*(actual income - reported income).

- If a VDP was introduced and the participant honestly reported his current income and voluntarily disclosed all previously unreported income, whether audited or not audited, his earnings would be:

$Y - tY$ , and can be expressed as:

Actual income - 0.30\*(reported income).

- If a VDP was introduced and the participant voluntarily disclosed part of the previously unreported income, and was detected for underreporting, his earnings will be:

$Y - tX - t(1 + f)(Y - X)$ , and can be expressed as:

Actual income - 0.30\*(reported income) - 0.3\*1.5\*(actual income - reported income).

## 5.4 Analytical approach

To establish the specific causal inferences between a VDP and taxpayers' compliance behaviour, we employed a difference-in-difference approach. The primary empirical model for this study is specified as follows:

$$C_{ist} = \beta_0 + \beta_1 dT + \beta_2 dR + \varphi dT * dR + \beta_4 Z_{ist} + \varepsilon_{ist} \quad (7)$$

Where:

- $C_{ist}$  is the compliance rate for individual  $i$  in group (session)  $s$  at time (round)  $t$ ;

- $dT$  is the treatment group dummy variable, equal to 1 in the session where a VDP applies, and 0 if otherwise. It is denoted as follows:  $treatVDP_{once}$  (for the once-off VDP without increased enforcement efforts),  $treatVDP\_Audit$  (for the once-off VDP with increased enforcement efforts),  $treatVDP\_perm$  (for the permanent VDP without increased enforcement efforts, and  $treatVDP\_perm\_Audit$  (for a permanent VDP with increased enforcement efforts);
- $dR$  is a round dummy variable, equal to 0 for the baseline period (period before the treatment i.e. rounds 1 to 6) and 1 for the end-line period (rounds 7 to 12);
- $Z$  is a vector of relevant individual controls. These include age, gender, respondents' total income, education level, the household income bracket of the respondent, marital status, whether the respondent was audited in the previous round, religion, ethnicity and tax filing experience; and
- $\varphi$  is the coefficient of interest and measures the causal effect of a VDP on compliance. More specifically, the coefficient of the interaction term of the treatment dummy and Round Seven dummy (i.e.  $dT * dRound_7$ ) measures the short-term<sup>5</sup> effects of the VDP on compliance. Likewise, the coefficient of  $dT * dRound_{8-12}$  establishes the long-run effect of treatment on compliance. The OLS estimate of  $\varphi$  is defined as follows:

$$\hat{\varphi} = (\bar{C}_{7-12}^{Treatment} - \bar{C}_{7-12}^{Control}) - (\bar{C}_{1-6}^{Treatment} - \bar{C}_{1-6}^{Control}) \quad (8)$$

Where the subscripts denotes time (rounds).

For robustness checks, a variety of regression specifications were conducted, whereby explanatory variables are included in the model on an incremental basis. The first model specification (Model 1) does not control for subjects' total income and the previous audit. The second model specification (Model 2) controls for the variables that were excluded from Model 1, which is the principal empirical model discussed above. Lastly, we employed a logistic model (Model 3) where the dependent variable (compliance) is defined as a binary that took the value of 1 if the subject fully complies and 0 if otherwise.

## 6 Results

The experiment was conducted with a panel of 206 subjects. The sample constituted 67 percent undergraduates (excluding first years) and 33 percent post-graduates. Of the population sample, 55 percent were male. The average age of the participants was 21 years. The racial composition for the population sample was as follows: 47.5 percent white, 33 percent black, 11 percent coloured and 8 percent other races. Of the total subjects, 27 percent had filed a tax

<sup>5</sup>In this study, short-term refers to the period in which the policy is introduced, whereas long-term refers to the period after the policy intervention.

return before. Each subject participated in only one session (where each session constituted 12 rounds). All participants had no prior exposure to laboratory experiments.

To examine the effect of VDPs on compliance, the study employed two approaches: descriptive statistical and regression analyses.

## 6.1 Descriptive statistics

The study employed descriptive statistics as a first step towards examining the effect of VDPs on compliance. The average compliance rates per session are depicted in Table 3.

In Session One (the control group), the average compliance rate was 0.40. The average compliance for Session Two was 0.60, which was higher than the average compliance rate obtained from Session One. A relatively higher compliance rate seems to suggest that taxpayers increased their compliance levels when subjected to a once-off VDP.

In Session Three, the average compliance rate was 0.61, which was relatively higher than that of the baseline session, suggesting that taxpayers will increase their compliance levels when subjected to a once-off VDP accompanied with an increased frequency of audits. Notably, the average compliance rate in Session Three was slightly higher than that in Session Two, which suggests that a once-off VDP could be more effective when augmented with increased enforcement measures.

In Session Four, the average compliance rate was 0.41, which was slightly higher than that of the baseline session. The marginal difference in the average compliance rates between Sessions One and Four may suggest that a permanent VDP without increased enforcement efforts does not have much effect on compliance.

In Session Five, the average compliance rate was 0.56, which was higher than that of the control group by 16 percentage points. The relatively higher average compliance rate in Session Five suggested that a VDP with increased enforcement measures was an effective compliance-enhancement mechanism. However, its effect on compliance was less than that of the once-off VDP with increased enforcement. These results seem to suggest that permanent VDPs are less effective than once-off VDPs in enhancing compliance levels.

## 6.2 Regression results

We employed the difference-in-difference model to establish the specific causal inferences between the different types of VDP and taxpayers' compliance behaviour. As previously discussed in Section 5.4, a variety of regression specifications were conducted (Models 1 to 3). Inferences were drawn from Model 2, a model with the highest  $R^2$ . The regression results are depicted in Table 4 and are mostly robust across all model specifications.

The results show a positive but statistically insignificant coefficient of  $treatVDP_{Ponce*round7}$ , suggesting that a once-off VDP without increased enforcement

measures have no material effect on compliance in the short-term. Thus, this type of VDP is unlikely to generate immediate revenue. Results from this study also show a positive but statistically insignificant coefficient of  $treatVDPonce\_Audit*rounds_{8-12}$ , implying that a once-off VDP without increased enforcement efforts have no effect on compliance in the long-term.

The coefficient of the variable  $treatVDPonce\_Audit*round_7$  (short-term effect of a once-off VDP with increased enforcement) is 0.125 and is statistically significant at a 10 percent level of significance. This shows that a once-off VDP with increased enforcement efforts have a positive short-term impact on compliance. More specifically, taxpayers increase their compliance rate by 0.13 percentage points in the short-term when subjected to a once-off VDP with increased enforcement measures. The study also found a positive but statistically insignificant coefficient of  $treatVDPonce\_Audit*rounds_{8-12}$ , implying that a once-off VDP with increased enforcement efforts have no effect on compliance in the long-term.

The variable  $treatVDPperm*round_7$  has a positive but statistically insignificant coefficient. This shows that a permanent (open-ended) VDP without increased enforcement measures have no significant effect on compliance in the short-term. Thus, this type of VDP is unlikely to generate immediate revenue for the government. The results also show a positive but statistically insignificant coefficient of  $treatVDPperm*rounds_{8-12}$ , which implies that a permanent VDP without increased enforcement measures have no significant effect on compliance in the long-term.

The coefficient of  $treatVDPperm\_Audit*round_7$  is 0.119 and is statistically significant at a 10 percent level of significance. This implies that a permanent VDP with increased enforcement measures caused taxpayers to increase their compliance levels in the short-term. More specifically, taxpayers increased their compliance levels by 0.12 percentage points when subjected to a permanent VDP with increased enforcement efforts. On the other hand, the coefficient for the variable  $treatVDPperm\_Audit*rounds_{8-12}$  is positive but statistically insignificant. This suggested that a permanent VDP with increased enforcement measures have no material effect on compliance in the long-term.

The regression model also accounted for the effect of taxpayers' experiences (past encounters) on compliance decisions in subsequent periods. Results from this study showed that taxpayers increase their compliance levels in the period subsequent to the period in which they are audited. We also that female taxpayers comply more than their male counterparts. This finding is contrary to Richardson (2006), who suggested that gender had no significant impact on compliance. A higher compliance rate by females confirms the findings of Engida & Baisa (2014) and Kastlunger, Dressler, Kirchler, Mittone & Voracek (2010), who found that women are more honest than men.

We also found no significant difference in compliance rates between participants who have filed a tax return before and those who never have. This finding confirms the results of Plott (1987), Alm & Jacobson (2007) and Alm, Bloomquist & McKee (2015), who found no significant differences in behavioural responses between real taxpayers and non-taxpayers in an experimental setting.

Other demographic variables that were controlled for include age, ethnicity, religion, work experience, current level of study, family annual income level and marital status. However, these control variables were largely insignificant in explaining the differences between individuals' compliance levels.

### 6.3 Conclusion

This study employed controlled laboratory experiments to investigate individual taxpayers' behavioural responses to VDPs. Results showed that both once-off and permanent VDPs are only effective in increasing compliance for the short-term, and that they are effective only when they are accompanied by increased enforcement measures. The results also showed that VDPs have no long-term effects on compliance. This is regardless of the type of VDP (whether once-off or permanent), or whether the VDP was accompanied with increased enforcement efforts or not. This study further established that a once-off VDP is more effective than a permanent VDP. In light of these findings, it is recommended that authorities avoid permanent VDPs. It is also recommended that authorities augment VDPs with increased enforcement measures (e.g. higher audit rates) to stimulate compliance among taxpayers.

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**Table 2: Experimental parameters**

Session	Rounds	VDP	Audit rate	Late-payment fine rate	Non-filing fine rate	Tax rate
1	1-12	No	10%	25%	50%	30%
2	1-6	No	10%	25%	50%	30%
	7-12	Yes*	10%	25%	50%	30%
3	1-6	No	10%	25%	50%	30%
	7-12	Yes*	30%	25%	50%	30%
4	1-6	No	10%	25%	50%	30%
	7-12	Yes**	10%	25%	50%	30%
5	1-6	No	10%	25%	50%	30%
	7-12	Yes**	30%	25%	50%	30%

\*Once-off VDP; \*\*Permanent VDP

**Table 3: Average compliance rates per session**

Session	Treatment	Mean	Standard deviation	Minimum	Maximum
1	None	0.40	0.39	0	1
2	Once-VDP without increased enforcement	0.60	0.41	0	1
3	Once-VDP with increased enforcement	0.61	0.39	0	1
4	Permanent VDP without increased enforcement	0.41	0.38	0	1
5	Permanent VDP with increased enforcement	0.56	0.41	0	1
Total		0.52	0.41	0	1

**Source:** Authors' own calculations.

**Table 4: Regression results**

Variables	Once-off VDP (no increase in enforcement)			Once-off VDP (with increase in enforcement)			Permanent VDP (no increase in enforcement)			Permanent VDP (with increase in enforcement)		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
treatVDPonce*round7	0.061 (0.061)	0.0274 (0.066)	1.731 (1.531)									
treatVDPonce*round8	-0.062 (0.061)	-0.063 (0.066)	0.930 (1.573)									
treatVDPonce*round9	0.019 (0.061)	0.021 (0.066)	0.919 (1.543)									
treatVDPonce*round10	0.029 (0.061)	0.044 (0.066)	0.672 (1.500)									
treatVDPonce*round11	0.005 (0.061)	0.001 (0.066)	-1.745 (1.505)									
treatVDPonce*round12	-0.010 (0.061)	-0.023 (0.065)	-1.891 (1.476)									
treatVDPonce_Audit*round7				0.153** (0.062)	0.125* (0.066)	2.914* (1.519)						
treatVDPonce_Audit*round8				0.084 (0.062)	0.049 (0.066)	2.423 (1.610)						
treatVDPonce_Audit*round9				0.080 (0.062)	0.045 (0.066)	0.221 (1.531)						
treatVDPonce_Audit*round10				0.086 (0.062)	0.064 (0.066)	1.016 (1.482)						
treatVDPonce_Audit*round11				0.130** (0.062)	0.088 (0.066)	0.592 (1.503)						
treatVDPonce_Audit*round12				0.101 (0.062)	0.044 (0.066)	1.122 (1.461)						
treatVDPperm*round7							0.122** (0.060)	0.101 (0.064)	2.382 (1.648)			
treatVDPperm*round8							-0.042 (0.060)	-0.056 (0.063)	0.987 (1.759)			
treatVDPperm*round9							0.015 (0.060)	0.003 (0.063)	0.683 (1.649)			
treatVDPperm*round10							-0.046 (0.060)	-0.028 (0.064)	-1.741 (1.727)			
treatVDPperm*round11							0.018 (0.060)	0.008 (0.063)	-0.672 (1.692)			
treatVDPperm*round12							-0.035 (0.060)	-0.039 (0.063)	-0.979 (1.685)			
treatVDPperm_Audit*round7										0.139** (0.067)	0.119* (0.072)	2.689* (1.482)
treatVDPperm_Audit*round8										0.053 (0.067)	-0.004 (0.072)	1.126 (1.536)
treatVDPperm_Audit*round9										0.130* (0.067)	0.0719 (0.072)	0.727 (1.459)
treatVDPperm_Audit*round10										0.100 (0.067)	0.0842 (0.071)	0.587 (1.398)
treatVDPperm_Audit*round11										0.023 (0.067)	-0.005 (0.071)	-0.378 (1.438)
treatVDPperm_Audit*round12										-0.037 (0.067)	-0.054 (0.071)	-0.219 (1.409)
Total income		0.000*** (0.000)	-0.009*** (0.002)		0.000*** (0.000)	-0.011*** (0.002)		0.000*** (0.000)	-0.009*** (0.002)		0.000*** (0.000)	-0.010*** (0.002)
Previous audit		0.146*** (0.022)	1.983*** (0.432)		0.010*** (0.022)	1.208*** (0.402)		0.135*** (0.023)	0.769 (0.485)		0.148*** (0.021)	1.143*** (0.353)
Female taxpayer	0.160 (0.120)	0.124*** (0.041)	2.152** (0.972)	0.155 (0.116)	0.127*** (0.044)	1.924** (0.805)	0.168* (0.099)	0.154*** (0.040)	1.765* (0.982)	0.062 (0.118)	0.048 (0.045)	0.797 (1.075)
Tax filing experience	0.086 (0.188)	0.057 (0.064)	-1.463 (1.332)	0.440*** (0.157)	0.375*** (0.060)	5.036*** (1.264)	0.056 (0.150)	0.046 (0.060)	2.103 (1.571)	0.053 (0.120)	0.023 (0.046)	-0.363 (1.000)
Constant	0.227 (0.615)	0.419** (0.210)	-4.400 (3.884)	0.175 (0.497)	0.326* (0.191)	0.736 (3.422)	0.332 (0.303)	0.447*** (0.126)	-1.219 (3.043)	0.386 (0.376)	0.592*** (0.148)	-2.731 (3.200)
Observations	900	898	730	948	946	803	936	934	803	924	922	779
R_squared	0.487	0.621		0.451	0.545		0.454	0.558		0.433	0.547	
Log likelihood			-191.29			-195.03			-156.93			-223.46
p-value	0.000	0.000	0.007	0.000	0.000	0.015	0.000	0.000	0.490	0.000	0.000	0.15

Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Source:** Authors' own calculations