Tax revenue mobilisation: improving personal income tax compliance in South Africa

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Declaration

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Abstract

South Africa, like any other country, strives towards greater domestic tax revenue mobilisation. As such, a lack of tax compliance is disconcerting, given its implications for the provision of public goods and services. The government has instituted various enforcement measures, such as audits and penalties, and provided 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. A further complication is that, even though there have been continuous efforts to improve compliance, authorities do not have precise knowledge of the scale and scope of non-compliance (i.e. the tax gap). The tax gap is the difference between the potential and the actual tax revenue collected. Against this background, this study used micro-simulation models and household income and expenditure survey data from Statistics South Africa to estimate the size of the country's Personal Income Tax gap. The findings revealed that South Africa lost significant revenue because of taxpayer non-compliance, particularly from provisional taxpayers.

The study also employed controlled laboratory experiments to investigate the behavioural responses of salaried and non-salaried individual taxpayers, in respect to tax audits and penalties. The results confirmed the findings from the tax gap analysis, that taxpayers evade more on their share of non-salaried income than on salaried income. The results also established that both salaried and non-salaried taxpayers increased their compliance levels when subjected to higher audit rates or higher penalty rates. However, audit rates had a relatively larger impact, suggesting that the authorities may need to consider increasing the frequency of audits to improve compliance. These findings suggest that, although deterrence measures are effective, the manner in which they are applied must be given careful consideration.

The study further examined taxpayers' behavioural responses to once-off and permanent voluntary disclosure programmes. A once-off voluntary disclosure programme is a temporary window where delinquents are allowed to report their unpaid taxes at no penalty. In contrast, a permanent voluntary disclosure programme is open-ended (it has no deadline). Using laboratory experiments, the study established 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 showed that both once-off and permanent voluntary disclosure programmes (with or without increased enforcement) had insignificant long-term effects on compliance. Furthermore, a once-off voluntary disclosure programme was more effective than a permanent voluntary disclosure programme in stimulating compliance.

As such, it is recommended that authorities avoid permanent voluntary disclosure programmes.

Opsomming

Soos enige ander land, streef Suid-Afrika na groter mobilisasie van plaaslike inkomste. As sulks is 'n gebrek aan die nakoming van belastingbetaling kommerwekkend, veral gegewe die implikasies daarvan op die voorsiening van openbare goedere en dienste. Die regering het reeds verskeie maatreëls ingestel om die betaling van belasting af te dwing, insluitend oudits en boetes. Uitstel (amnestie en vrywillige blootleggingsgsprogramme) word ook aan oortreders verleen wat vrywilliglik hulle vorige ongerapporteerde inkomste onthul. Ten spyte hiervan dui navorsing oor die doeltreffendheid van hierdie maatreëls gemengde reaksies in ontwikkelde lande aan. Dit is dus noodsaaklik om die geskiktheid van hierdie beleidsmaatreëls in meer diepte te ondersoek, veral ook vir ontwikkelende lande.

'n Verdere probleem is dat, ten spyte van deurlopende pogings om toegewings te verbeter, die owerheid steeds nie akkurate kennis van die skaal en omvang van nie-nakoming van betaling (met ander woorde "die belastinggaping") het nie. Die belastinggaping is die verskil tussen die potensiële en die werklike ingevorderde belastinginkomste. Teen hierdie agtergrond gebruik hierdie studie mikro-simulasie modelle en huishoudelike inkomste en uitgawe data van Statistieke Suid-Afrika om 'n aanduiding te gee van die grootte van die land se Persoonlike Inkomste Belasting gaping. Die bevindinge het onthul dat Suid-Afrika aansienlike inkomste verloor as gevolg van onbetaalde belastingelde, veral deur voorlopige belastingbetalers.

Die studie het ook gekontroleerde laboratorium eksperimente aangewend om die gedragsreaksies van individuele belastingbetalers wat 'n salaris verdien en diè wat nie n salaris verdien nie, ten opsigte van belasting oudits en boetes te bepaal. Die resultate het die bevindinge van die belastinggaping analise ondersteun dat belastingbetalers wat nie 'n salaris verdien nie hoër belastingontduikingsgedrag toon as diè wat wel 'n salaris verdien. Die resultate het ook getoon dat beide tipe belastingbetalers se samewerking tot betaling verhoog wanneer hulle onderwerp word aan 'n hoër waarskynlikheid van 'n oudit, asook hoër boete-opleggings. 'n Hoër waarskynlikheid van 'n oudit het 'n relatief groter impak gemaak, wat veronderstel dat owerhede 'n verhoging in die frekwensie van oudits behoort te oorweeg om betaling te bevorder. Hierdie bevindinge toon dat alhoewel afskrikmiddels doeltreffend is, die wyse waarop hul toegepas word versigtige oorweging verdien.

Die studie het verder die belastingbetaler se gedragsreaksies op eenmalige en vrywillige blootleggingsprogramme bepaal. 'n Eenmalige vrywillige blootleggingsprogram voorsien 'n tydelike vensterperiode waarbinne oortreders toegelaat word om hul onbetaalde belasting te rapporteer met geen strafoplegging nie. In teenstelling het 'n permanente blootleggingsprogram geen sluitingsdatum nie (daar is dus nie 'n sperdatum nie). Deur die gebruik van laboratorium eksperimente het die studie bepaal dat beide eenmalige en permanente blootleggingsprogramme effektief is om betalingsnakoming te verhoog in die korttermyn, maar slegs indien die program

vergesel word van verhoogde handhawende maatreëls.   Die resultate het ook getoon dat beide eenmalige asook permanente vrywillige blootleggingsprogramme (sonder of met verhoogde handhawende maatreëls) byna geen langtermyn gevolge op die samewerking van belastingbetalers het nie. Verder is vasgestel dat 'n eenmalige blootstellingsprogram meer effektief is as 'n permanente vrywillige blootstellingsprogram om samewerking te bevorder. As sulks word dus aanbeveel dat owerhede permanente vrywillige blootleggingsprogramme vermy.

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List of acronyms and abbreviations

ARIMA	Autoregressive Integrated Moving Average
A-S	Allingham and Sandmo Model
A-S&Y	Allingham, Sandmo and Yitznaki Model
BQMS	Branch Queue Management System
CIPC	Companies and Intellectual Property Commission
CIT	Corporate Income tax
CRS	Common Reporting Strategy
DCE	Detection Controlled Estimation
DID	Difference-in-difference
DYMIMIC	Dynamic Multiple Indicators Multiple Causes
ESS	Estonian Social Survey
GDP	Gross Domestic Product
HIE	Household Income and Expenditure
HMRC	Her Majesty's Revenue and Customs
IES	Income and Expenditure Survey
IRS	Internal Revenue Service
ITPR	Individual Taxpayer Policy Registration
LFS	Labour Force Survey
LM	Breusch-Pagan Lagrangian Multiplier
NRP	National Research Program
OECD	Organisation for Economic Co-operation and Development
PAYE	Pay-As-You-Earn
PIT	Personal Income Tax
QLFS	Quarterly Labour Force Survey
SADC	Southern African Development Community
SARS	South African Revenue Service
SDG	Sustainable Development Goals
Stats SA	Statistics South Africa
SVDP	Special Voluntary Discloure Programmes
VAT	Value Added Tax
VDP	Voluntary Discloure Programme
ZIMRA	Zimbabwe Revenue Authority

CHAPTER 1

INTRODUCTION

1.1   RESEARCH BACKGROUND

Tax revenue plays an integral role in creating the fiscal space for the provision of public services and infrastructure development. However, developing countries generally struggle to raise sufficient revenue to meet expenditures. African countries, in particular, are under pressure to raise more revenue, following the adoption of the African Union's Agenda 2063, the Regional Economic Communities' strategic priorities and the universal Sustainable Development Goals (SDGs), which mandate governments to invest more in health, education and poverty alleviation projects, amongst sectors. Although significant efforts have been made to strengthen domestic revenue mobilisation through tax policy and improved tax administration, African countries continue to collect low levels of tax revenue. One explanation for the seemingly low levels of tax revenue is non-compliance by taxpayers. As such, governments continue to institute measures that seek to improve tax compliance. However, tax systems vary across countries.

In South Africa, tax revenue constituted approximately 25 percent of the Gross Domestic Product (GDP) between 2004/05 and 2016/17 and is amongst the highest in the region, though lower than that for the Organisation for Economic Co-operation and Development (OECD), countries which is approximately 35 percent of GDP (National Treasury and SARS, 2017; OECD, 2017). Tax revenue is the main source of government income in South Africa and is comprised of direct taxes (e.g. Personal Income Tax and Corporate Income Tax) and indirect taxes (e.g. Value Added Tax, fuel levies and excise taxes). Over the past years, Personal Income Tax (PIT), Value Added Tax (VAT) and Corporate Income Tax (CIT) have been the main sources of tax revenue. They respectively account for an average of 35, 26 and 20 percent of the total tax revenue between 2004/05 and 2016/17. For PIT, the incidence of taxes are concentrated amongst high-income earners, and therefore serves the purpose of redistributing income. This is particularly relevant in South Africa, a country that is characterised by large income inequalities, with an average Gini coefficient of 0.7 (Steenekamp, 2012; StatsSA, 2014). Given the dual role played by PIT, this tax head is given more primacy over other sources of revenue. There is, however, limited scope to raise additional revenue by increasing the marginal rates. This is because South Africa's maximum marginal tax rate is high (in the 2017 budget it was increased to 45%). This rate is much higher than the 30 percent average of SADC countries (Van Heerden & Schoeman, 2013: 2). As such, a further increase in the marginal rates may discourage productivity and encourage early retirement and even tax evasion (Van Heerden & Schoeman, 2013: 2). As pointed out by Steenekamp (2012b) and Kemp (2017), an increase in the top tax rate could result in efficiency losses. Hence, the government must explore

other mechanisms of raising revenue, and one possibility is to increase compliance with the requirements of the tax legislation.

Despite the general increase of PIT revenue over the years, the number of assessed tax returns as a proportion of expected tax returns[1] has been declining (National Treasury and SARS, 2010, 2015, 2017). One possibility behind the decline is an increase in the number of late submissions and non-filings. Intuitively, late and non-submission of tax returns reduce the number of expected returns. Oberholzer & Stack (2009: 737) highlighted that a significant number of taxpayers could be outside the tax net, causing the state to lose a substantial amount of revenue. The Davis Tax Committee[2] also pointed out that the government might be losing a sizeable amount of tax revenue through non-compliance (DTC, 2014: 25). It would, therefore, be essential for the government to consider mechanisms to improve compliance.

Apart from efforts to improve compliance, establishing what causes it is important knowledge for policy design. Although the South African tax system is perceived to be plagued with significant levels of non-compliance, the scale and scope of the tax gap remains an unresolved question (DTC, 2014: 25). The tax gap is a measure of the extent of tax losses as a result of non-compliance. It is defined as the difference between the value of theoretical tax revenue and actual collections, where theoretical revenue is the amount of tax which the government should collect if every taxpayer complied with the tax legislation (Toro, Ogata, Hutton & Caner, 2013: 14). The tax gap can be a result of tax avoidance (a situation whereby taxpayers take advantage of legal loopholes within the tax system to reduce their tax liabilities) or tax evasion (where taxpayers may, in contravention of the law, intentionally under-report their taxable income). Tax evasion includes under-reporting taxable income, overstating deductions and late or non-filing of tax returns (Gcabo & Robinson, 2007: 358). The tax gap constitutes a revenue loss for the state, which in turn negatively affects government's efforts in fulfilling its obligations. Controlling the tax gap is therefore crucial.

Knowledge about the extent and scope of the tax gap is a useful first step towards controlling non-compliance and preventing its occurrence. For instance, it may serve as a tool to measure the effectiveness of a tax policy. It may also serve as a measure of administrative efficiency, as a higher tax gap may indicate poor administrative performance. Tax gap estimates can provide information on the sources of the tax losses, which may assist in a more effective usage of resources in enforcing compliance.

Over the past years, the South African government has implemented several measures to improve compliance, which includes the recruitment of competent personnel and an increased capacity to audit and prosecute tax offenders. The government also introduced new penalties for tax offenders.

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[1] The ratio of assessed taxpayers to total expected tax returns is the actual number of submitted returns as a proportion of total expected returns (SARS, 2010, 2015, 2017).
[2] The Davis Tax Committee is a tax review committee appointed by the government on the 17th of July 2013 to inquire into the role of South Africa's tax system in the promotion of inclusive economic growth, employment creation, development and fiscal sustainability.

For instance, following the upsurge in the number of late and non-submission of tax returns, the government introduced an administrative penalty regime in 2009, targeting those who failed to meet submission deadlines. The administrative penalty is comprised of fixed amount and percentage-based penalties.

The government has also introduced a series of tax reprieves, whereby delinquents are allowed to rectify their tax status at reduced (or no) penalties that are associated with non-compliance. These reprieves were meant to complement the existing efforts to increase voluntary compliance, and consisted of two types: amnesties and Voluntary Disclosure Programmes (VDPs). Under a typical amnesty, delinquents are exempted from paying both the tax owed and any penalties associated with non-compliance. However, in a VDP regime, although taxpayers may be exempted from the penalties, they would still be required to pay their previous unpaid tax dues (Marino, 2015; Mastellone, 2015; OECD, 2015).

The first tax amnesty was introduced in 1995, allowing unregistered taxpayers to enter the tax net at no penalty. In 1996, a second amnesty was introduced to provide taxpayers with additional time to rectify their tax affairs. 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 last amnesty was introduced in 2006 for small businesses. Importantly, the impact of these tax reprieves on compliance remains an unresolved question.

Subsequent to the amnesties, the government introduced a series of VDPs to further encourage voluntary compliance. The first VDP was introduced in 2010, for all taxes under the administration of the South African Revenue Service (SARS) and for both onshore and offshore-undeclared income. In 2012, the government re-introduced the VDP through an Act of Parliament, the Tax Administration Act 28 of 2011. 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 would be available for as long as the provisions were contained in the Tax Administration Act. In 2016, the government introduced the Special Voluntary Disclosure Programme (SVDP), a reprieve window specifically for taxpayers with undisclosed offshore income. The reprieve ran concurrently with the already existing (permanent) VDP (SARS, 2016: 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.

1.2   RESEARCH PROBLEM

South Africa, as in many other countries, want to improve domestic resource mobilisation. To that end, the government has thus far instituted several measures to improve compliance, such as increasing audit and penalty rates. Empirical evidence on the efficacy of these measures are, however, mixed and concentrated in developed countries. The diversity in the empirical evidence

seems to suggest that the efficacy of audit and penalty rates vary from country to country, and this could be due to country or cultural differences. Given that less evidence is available for developing countries, despite increased implementation thereof, it is imperative to investigate taxpayers' behavioural responses to these measures in a developing country context. A further research focus is determining the source of non-compliance. Existing studies largely focused on personal income in its aggregated form (a combination of salaried and non-salaried income). However, it is possible that salaried and non-salaried taxpayers have different compliance levels, as they report their incomes under different mechanisms. Salaried taxpayers report their income through a third party, while non-salaried individual taxpayers self-report. As such, it is possible that these two groups exhibit different responses to enforcement measures. Using aggregated data (such as total income) in examining taxpayers' behavioural responses is susceptible to the concealment of important evidence, particularly on the different types of individual taxpayers. This could be one of the reasons for the divergence in responses (evident in the empirical literature).

Apart from the traditional measures (audits and penalties), the government introduced a series of tax reprieves in the form of amnesties and VDPs. However, tax reprieves are controversial, both in theory and in practice, as there is no consensus among researchers on their efficacy as a compliance-enhancing mechanism (see Leonard & Zeckhauser, 1987; Fisher, Goddeeris & Young, 1989; Alm, McKee & Beck, 1990; Andreoni, 1991; Torgler, Schaltegger, Christoph & Svaffner, 2003; Saraçoğlu & Lu, 2011; Bayer, Oberhofer & Winner, 2014). Empirical evidence also focused on temporary amnesties drawn from developed country applications. There is, therefore, limited knowledge on the efficacy of VDPs (both temporary and permanent) on compliance, particularly also from a developing country perspective. Such a knowledge gap may compromise the efforts to stimulate compliance amongst taxpayers.

Importantly, despite all the efforts towards improving compliance, authorities do not have precise knowledge of the scale and scope of the tax gap (DTC, 2014: 25). Considering that tax gap estimates show the scale and source(s) of the tax loss, such knowledge is vital to control non-compliance. Understanding the scope and magnitude of the tax gap may be a useful first step in controlling non-compliance and preventing its occurrence (European Commission, 2016: 13). As such, the knowledge gap about the size and scope of the tax losses may compromise the effectiveness of compliance-enforcement measures. For instance, the authorities may fail to allocate resources where they are needed the most in enforcing compliance, which may increase the administrative costs (apart from the failure to address non-compliance). Furthermore, considering that the tax gap estimate may serve as a measure of the tax authority's administrative efficiency, lack of knowledge on the magnitude of the tax gap may therefore compromise the efforts to improve the performance of the tax authority.

1.3   OBJECTIVES OF THE STUDY

In light of the foregoing discussion, the main objective of this study was to estimate the level of non-compliance in the South African tax system by determining the tax gap for PIT, and to establish taxpayers' behavioural responses to compliance-enhancement measures.

Specific objectives of this study included:

- To estimate the extent and nature of South Africa's PIT gap, disaggregating the gap by the type of income (salaried and non-salaried) and by its nature (compliance and policy gaps);
- To examine the behavioural responses of salaried and non-salaried income taxpayers to changes in audit and penalty rates, to inform the impact on compliance;
- To examine individual taxpayers' behavioural responses to VDPs, to inform the impact on compliance; and
- To use the results of the study to suggest improvements to the existing tax system in order to stimulate and sustain compliance.

1.4   METHODOLOGICAL APPROACHES

This study employed two approaches: micro-simulation models to estimate the tax gap, and controlled laboratory experiments to investigate taxpayers' behavioural responses to audit rates, penalty rates and VDPs.

1.4.1   Micro-simulation model: estimating the tax gap

There are fundamentally two approaches to measuring the tax gap: the top-down and bottom-up approaches. The top-down method uses macro-economic data to estimate the theoretical tax liability from which actual collections are deducted, so as to establish the amount of uncollected taxes. The top-down approach is based on the assumption that the data source used to estimate the tax gap covers the full tax base (Rubin, 2011; European Commission, 2016), making it essential to use data from national accounts (data that is representative enough of the tax base). This approach is suitable to estimate tax gaps for tax heads with a single (or flat) tax rate. Since the top-down approach estimates the tax gap based on a single tax rate that is applied on a single and broad data source, this approach provides single and broad estimates of the tax gap. In other words, the top-down approach is most suitable for estimating indirect taxes. Although this approach is less time consuming, its main disadvantage is that it does not establish the causes and structure (components) of the tax gap, as it provides a broad and aggregated estimate of the tax gap. The results are therefore not directly useful for compliance management (Fuest & Riedel, 2009; IMF, 2013; European Commission, 2016).

Unlike the top-down approach, which theoretically starts with a data source that is sufficiently representative of the tax base, a bottom-up approach uses one or more data sources that cover

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components of the tax base (European Commission, 2016: 24). Thus, the bottom-up approach uses micro-economic data to estimate the magnitude of the tax gap. The tax gap is estimated by simulation (extrapolation) of data for the entire population, respective to the tax head under investigation. The main advantage of this approach is that it establishes the extent of the tax gap by its causes and structure. In other words, the bottom-up approach gives detailed and specific information on the size and causes of the tax gap. It also establishes the tax gap by the type of taxpayer (e.g. salaried and non-salaried). Importantly, this approach is most suitable for the estimation of tax gaps for direct taxes.

In view of this discussion, a bottom-up approach was employed in this study to estimate South Africa's PIT gap. Specifically, this study employed the methodology used by Ahmed & Rider (2013) in their study on estimating the tax gap for Pakistan. Based on the Individual Tax Return form (ITR 12 form), a tax calculator was developed to estimate the individual theoretical tax liability, which is the amount of tax revenue which the government should collect if every taxpayer complied with the tax legislation. The study used Household Income and Expenditure (HIE) survey data from Statistics South Africa (Stats SA). The actual tax collections obtained from SARS were deducted from the estimated theoretical tax liability to establish the tax gap.

1.4.2 Controlled laboratory experiments: compliance behaviour

Tax evasion, by its nature, represents illegal behaviour. As such, taxpayers conceal their illegal actions to avoid the consequential results associated with non-compliance. The fundamental challenge in the analysis of taxpayers' behaviour is therefore the absence of detailed and reliable field data on individual compliance choices (Alm, Jackson & McKee, 1992; Friedman & Sunder, 1994; Alm, 2010). To counter this difficulty, researchers have turned to the generation of such data by using controlled laboratory experiments, an approach that allows for the generation of more reliable data on human decision-making, data that cannot be reliably generated in a naturally occurring world.

Laboratory experiments provide a researcher with two critical benefits: control and flexibility. Thus, experiments allow for full control of institutions and incentives, such that subjects can correctly reveal their actions (Alm, Bloomquist & McKee, 2015: 1171). Linked to that, experiments enable the researcher to generate data on individual and group choices in an environment where treatments can be varied flexibly and independent of the other, thereby allowing the experimenter to examine responses to distinct variations of treatment variables. Such a control hardly exists in a naturally occurring world (Alm, 2010: 641). In light of this, this study used controlled laboratory experiments to investigate how salaried and non-salaried income taxpayers respond to audit and penalty rates. Experiments were further employed to investigate how individual taxpayers responded to once-off and permanent VDPs, with and without increased enforcement measures.

1.5   SIGNIFICANCE OF THE STUDY

The South African government has been instituting several measures to stimulate compliance amongst taxpayers. Although the government has made significant efforts to improve compliance, the scale and scope of the tax gap are unknown to the authority. Considering that the tax gap constitutes a loss of revenue for the state, it is important to control and prevent such a loss of revenue. Tax gap estimations may establish the causes of the tax loss. Knowledge about the size and structure of the tax gap may enable the authorities to allocate resources where they are needed the most in enforcing compliance. Tax gap estimates may, therefore, serve as a crucial first step towards minimising and preventing non-compliance. Furthermore, tax gap estimates may serve as a tool to monitor the effects of a legislative or administrative measure on tax revenue. In sum, knowledge about the tax gap is necessary to guide authorities in formulating, designing and implementing more effective compliance-enforcement measures. For these reasons, it is important to have reliable estimates of the tax gap. However, the challenge (particularly in a developing country where data are often sparse) is to estimate the tax gap in sufficient detail and with sufficient accuracy to provide meaningful guidance to policymakers and tax administrators to improve the performance of the tax system (Ahmed & Rider, 2013: 335).

As previously discussed, the government has been employing audits and penalties to encourage taxpayers to comply with the requirements of the tax legislation, though empirical evidence on the efficacy of these measures are mixed. Furthermore, the studies are drawn mainly from developed country case studies and have been focussing on compliance in its aggregated form. However, considering that the PIT system constitutes salaried and non-salaried taxpayers, it is possible that these two groups of taxpayers respond differently to policy measures. In view of this, this study focused on a developing country application and disaggregated compliance by the type of income (salaried and non-salaried). Findings from this study will fill in the knowledge gap on the effect(s) of audit and penalty rates on salaried and non-salaried income taxpayers.

Apart from audits and penalties, the government has (since 2010) been introducing a series of VDPs. However, empirical studies on the efficacy of tax reprieves are inconclusive. Notably, these studies have been focussing on the efficacy of temporary amnesties and have been drawn largely from developed country applications. This study will therefore fill in the knowledge gap on the effect of VDPs (temporary and permanent) on compliance, particularly from a developing country perspective. The majority of the existing studies have been using data from national accounts (secondary data); in contrast, this study used controlled laboratory experiments, hence expanding the existing body of knowledge on tax compliance. Findings from this study will help policymakers and administrators to improve the existing policy in stimulating and sustaining compliance. Importantly, although this study focussed on South Africa, the lessons learnt may be applicable to other developing countries in Africa (and beyond).

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1.6   OUTLINE OF THE STUDY

Having discussed the background of the study, the research problem, the objectives of the study, the methodological approaches used and the significance of the study, the rest of the dissertation is structured as follows: Chapter 2 provides an overview of South Africa's PIT policy. It explains the mechanisms taxpayers take to evade and avoid taxes, and the measures the government has been taking to tackle non-compliance (or stimulate compliance). This chapter lays the foundation for all the subsequent chapters.

Chapter 3 estimates the country's PIT gap, disaggregating it by the type of income (salaried and non-salaried). The tax gap is further disaggregated by its nature (source) i.e. establishing the tax loss resulting from non-compliance (the compliance gap) and the amount of tax revenue that remained uncollected due to tax expenditures (exemptions). To estimate the tax gaps, the study employed some micro-simulation models, using HIE survey data from Stats SA.

Chapter 4 provides a review of experimental methods, which are the methodological approaches for the subsequent chapters, to examine taxpayers' behavioural responses to policy instruments. This chapter explains the different types of experiments, while highlighting their relevance and limitations in examining economic behaviour.

Chapter 5 employs controlled laboratory experiments to examine the behavioural responses of individual taxpayers to changes in audit and penalty rates. The study focused on the two types of income that constitute individual income, which are salaried and non-salaried income. The disaggregation of income seeks to establish the effect of deterrent measures on salaried and non-salaried taxpayers.

Chapter 6 discusses the different types of tax reprieves offered to taxpayers to stimulate compliance. This chapter employs controlled laboratory experiments to investigate individual taxpayers' behavioural responses to once-off and permanent VDPs, with and without increased enforcement measures, to inform the impact on compliance.

Finally, Chapter 7 provides the conclusion to the study, discussing the main findings and policy implications of the study. This chapter further provides a discussion of the study's limitations and recommendations for further research.

CHAPTER 2

THE SOUTH AFRICAN PERSONAL INCOME TAX SYSTEM

2.1   INTRODUCTION

PIT is the main source of South Africa's tax revenue, contributing 35 percent of the total revenue and about nine percent of GDP (National Treasury and SARS, 2017: 10). Importantly, PIT has a dual role: it serves the purpose of raising revenue and ensuring that equity objectives are met (Steenekamp, 2012a: 40). Despite its importance, income taxes (like any other tax) are generally a burden to taxpayers, which may prompt taxpayers to misreport their incomes to reduce the tax liabilities. However, the reduction of tax liabilities constitutes a loss of public revenue, which may distort the performance of the tax system and may reduce the capacity of the government to fulfil its obligations.

Given the need to improve compliance amongst taxpayers, the South African government implemented several measures (such as changing marginal tax rates and penalty structures), which significantly changed the tax system, particularly also the PIT system. The government also introduced some tax reprieves, allowing delinquent taxpayers to pay their previously unpaid taxes at no penalty associated with non-compliance. However, although the government has made some efforts to stimulate compliance among taxpayers, the level of (non-) compliance remains an unresolved question. Given that evasion by its very nature represents illegal behaviour, it is imperative to investigate taxpayers' behavioural responses to some of these measures to inform the impact on compliance. In other words, it is necessary to investigate the effectiveness of tax instruments in stimulating compliance among taxpayers. Results thereof will guide the authorities on how best tax measures can be used to reduce non-compliance.

In light of the foregoing discussion, this chapter discusses the South African PIT system, highlighting its tax base, the tax rate structure and the different reporting mechanisms for individual taxpayers. The chapter further discusses some mechanisms employed by taxpayers to reduce their tax liabilities, as well as the measures that have been introduced by the government to improve tax collections. The rest of this chapter is structured as follows: Section 2.2 provides an overview of the structure of the PIT system, covering the tax base and the tax structure. This section also discusses the different reporting mechanisms for salaried and non-salaried (provisional) individual taxpayers. Section 2.3 explains the mechanisms taxpayers use to evade and avoid taxes. Section 2.4 discusses the different measures that have been implemented by the government to improve compliance over the past years. The efficacy of some of these will be examined in subsequent chapters. Thus, this section lays the foundation from which the subsequent chapters are drawn. Section 2.5 concludes.

2.2   AN OVERVIEW OF THE PERSONAL INCOME TAX SYSTEM

South Africa was under international sanctions during the period prior to 1994 and, as a result, opportunities for South Africans to invest outside the country were very limited. This situation confined the government to levying tax on income arising from within its terrestrial borders (South African Reserve Bank, 2016: 1). However, following the change of government in 1994, South Africa was integrated into the global economy, a move that enabled South Africans to expand their business activities into foreign markets. In line with the new economic outlook, the tax regime had to change to be both internationally competitive and to protect the local market from abuse (SARS, 2016c: 442). For instance, there was a need to change the tax regime to enable the government to tax its residents on income they raised outside the country. It was against this backdrop that the government migrated from a pure source-based to a worldwide or residence-based tax system in 2001. Under the residence tax regime, the country's residents were levied on their worldwide income. The adoption of the residence-based principle also served as a measure to discourage taxpayers from shifting income out of the country, in a bid to evade or avoid paying tax (Dharmapala, 2008: 6). However, empirical evidence on the efficacy of this system in reducing non-compliance are mixed.

2.2.1   The tax base

In South Africa, income is taxed based on the residence (worldwide basis) principle. As such, residents pay taxes on their total (worldwide) income, i.e. income sourced from within and without South Africa's geographical boundaries (Black, Calitz & Steenekamp, 2015: 254). The PIT base consists of salaries, wages, annuities, dividends, interest earned, rental income and retirement fund lump sum benefits, among others. However, non-residents are taxed only on income from a source within (or deemed to be within) South Africa (Manuel, 2002; National Treasury, 2001). This includes director's fees earned where the company's head office is located in South Africa. In the case of interest earned on a loan, non-residents are taxed only if the source of interest earned is within South Africa. However, dividends are exempt from non-residents' income.

To broaden the tax base, the government introduced several measures. For instance, in 2001 the government made nearly all fringe benefits within the remuneration package structure taxable (Manuel, 2002; National Treasury, 2001). Fringe benefits that were previously non-taxable include residential accommodation, company car schemes and travel allowances. In the same year, the government introduced capital gains tax, whereby income tax is levied on a portion of the gains realised from the disposal of an asset. The introduction of capital gains tax was not only part of the base-broadening effort but also an initiative to curb tax avoidance. Before the introduction of capital gains tax, tax planners would manipulate revenue and capital receipts in order to avoid and/or reduce taxes (AfDBG, 2010: 12). Further, capital gains tax was introduced as an income-redistribution mechanism, which was meant to promote equity by ensuring that those with more income bear more tax burdens (Marcus, 2007; AfDBG, 2010). The introduction of capital gains tax was also

necessitated by the need to align South Africa's tax system with the international tax standards, as the tax head had already been adopted across many countries. A total of R107.1 billion has been raised through the capital gains tax since its introduction, of which R9.6 billion was raised from individual income taxpayers in the 2016/17 period, which is 1.8 percent of the total PIT revenue (National Treasury and SARS, 2017: 252).

To lessen the tax burden, the government provide taxpayers with some tax expenditures, which consist of exemptions (e.g. a tax-free portion of interest), deductions and rebates (or credits). Tax deductions include pension fund contributions, contributions to retirement annuity funds, contributions to medical aid funds, and medical expenditures. These deductions serve different purposes: for instance, those in respect of pensions fund contributions and contributions to retirement annuity funds are meant to incentivise taxpayers to save income for their old age. Notably, a tax deduction of a given amount is worth more to a person with a high marginal tax rate than a lower marginal rate (Black *et al.*, 2015: 257). It is for this reason that deductions for medical aid contributions and expenses were converted into tax rebates from 1 March 2012. Tax rebates (or credits) are intended to provide some relief to the poor and the aged. Prior to 2015/16, rebates were classified into two categories: for taxpayers below the age of 65 and for those above 65 years of age. In 2015/16, a third category was introduced, for those aged 75 years and older. The rebates are adjusted annually to account for inflation.

Although tax expenditures play an integral role in reducing taxpayers' burdens, they reduce the size of the tax base. For instance, in the 2012/13 fiscal year, the government had to forego R48.3 billion worth of revenue on account of tax expenditures (National Treasury, 2018: 124), which is approximately 18.8 percent of the total PIT revenue collected in that year. In 2015/16, tax expenditures accounted for a total of R58.3 billion worth of personal income revenue foregone, representing approximately 15 percent of the total PIT revenue collected in that year. Although tax expenditures reduce the tax base, they may also provide an important benefit to the economy by reducing inequality (Chetty, Hendren, Kline & Saez, 2015: 1). However, the effect of tax expenditures on inequality in the South African economy remains aquestion still to be answered.

2.2.2   The tax rate structure

In South Africa, PIT is a progressive tax system; as such, the tax rate increases as the amount of taxable income increases (Black *et al.*, 2015: 256). The current minimum marginal rate is 18 percent, whilst the maximum is 45 percent. A progressive income tax system serves to satisfy the principle of equity. In terms of the equity principle, taxes should be levied in accordance with taxpayers' ability to pay (Marcus, 2007; Black *et al.*, 2015). As such, taxpayers within the same income bracket should pay the same tax, thus satisfying the principle of horizontal equity. At the same time, taxpayers with more income should accordingly pay more taxes, thus satisfying the principle of vertical equity, with the aim to achieve a more equal distribution of after-tax income. PIT therefore serves as a

redistributive tax as it concentrates the incidence of taxes on the high-income earners, thereby reducing income inequalities between the poor and the non-poor. Thus, the equity principle is realised only when the tax system is progressive (Black *et al.*, 2015: 258).

The progressivity of PIT is affected by marginal rates and by what happens to tax thresholds (Steenekamp, 2012a: 45). Over the past years, the government has been adjusting the marginal rates. Figure 2.1 depicts the minimum and maximum marginal tax rates for the period 1980/81 to 2016/17.
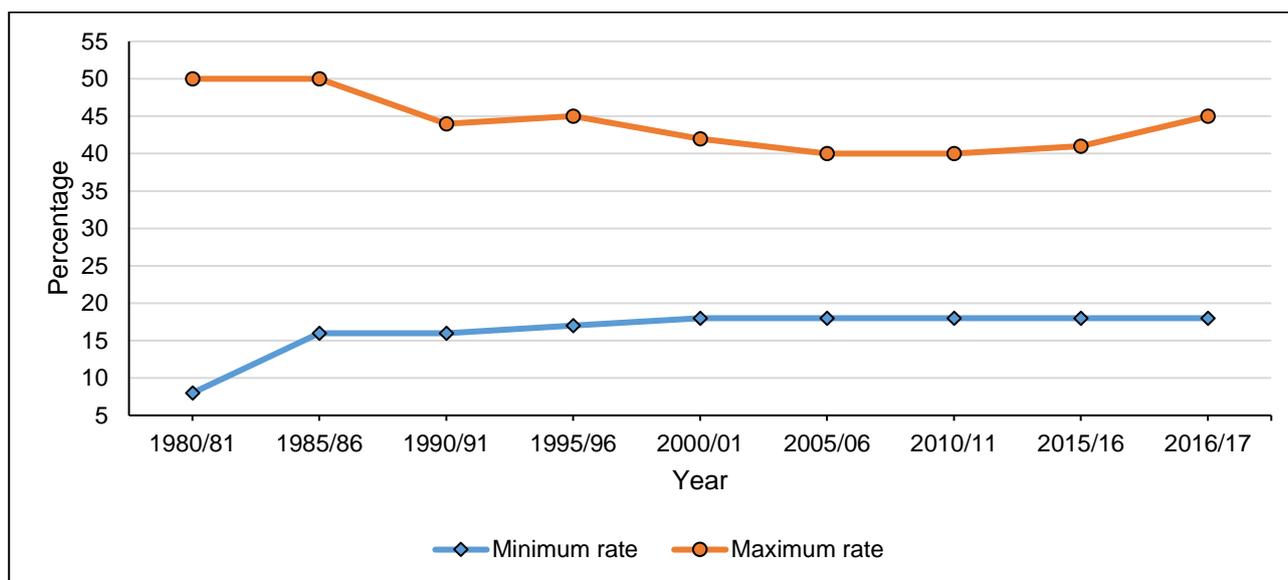
Figure 2.1: Maximum and minimum marginal tax rates, 1980/81 - 2016/17

Source: South African Reserve Bank, 2016 and National Treasury and SARS, 2017**.**

The number of taxable income brackets have also been adjusted over the past years. For instance, the number of taxable income brackets were reduced to ten in 1994/95 from twenty-four in 1980/81, and were further reduced to six in 2016/17 (Gavin & Steyn, 2016; SARS, 2017). Furthermore, the taxable income thresholds are adjusted annually to account for inflation. Importantly, individuals whose income fall below the minimum taxable threshold are not required to submit returns (National Treasury and SARS, 2017: 36).

Evidence show that the South African PIT system is progressive. For instance, Nyamongo & Schoeman (2007) examined the progressivity of personal income in South Africa over the period 1989 to 2003. The study found that the tax system had generally been progressive. However, the progressivity had been declining from 1994. Steenekamp (2012a) also examined the progressivity of South Africa's PIT system for the period 1994 to 2011 and found that the system is progressive. However, the progressivity had been declining between 1994 and 2009. Inchauste, Lustig, Maboshe, Purfield & Woolard (2015) also established that South Africa's PIT system was progressive, but its progressivity was less than that of other middle-income countries (Inchauste et al., 2015: 16).

In addition to satisfying the equity principle, a good tax system should be economically efficient, i.e. it should not create an excess burden (Black *et al.*, 2015: 235). However, the South African PIT system is characterised by a narrow tax base and a high tax burden, to the extent that a R1 revenue increase (due to a further increase of the top marginal tax rate) would result in an efficiency loss that ranges between R0.39 and R3.16 (Steenekamp, 2012b: 24). Kemp (2017) also established that the overall elasticity of taxable income is approximately 0.3, while that of the broad income is significantly lower. This overall elasticity is primarily due to the elastic response of taxable income for taxpayers who have incomes above R380 000, who have an elasticity of closer to 0.4. Importantly, the findings from Steenekamp (2012b) and Kemp (2017) suggest that the scope for increasing PIT revenue through increasing tax rates is limited. In spite of this, the government increased the top marginal tax rate in 2017/18 from 41 to 45 percent (see Figure 2.1).

2.2.3   PIT administration

South Africa has a dual PIT reporting system: a withholding tax system (for earned income) and a self-assessment system (for non-salaried income). PIT collections therefore constitute employees' tax (Pay-As-You-Earn (PAYE)) and provisional tax (non-salaried tax). Taxes on salaried income are withheld at the source, in that they are paid to the tax authority by the employer. After the tax on remuneration income is paid, the employer issues the employee with a tax certificate, which is a summary of the earnings and deductions (or payable income) reported to the tax authority (SARS, 2016a: 7). The tax certificate serves as proof to the employee that his or her tax due has been paid. If the employee is not in agreement with the contents of the tax certificate, or if there are refunds to be claimed, he or she directly engages the tax authority by submitting a tax return (SARS, 2016a: 7). Thus, an employee will be able to 'assess' declarations made on his or her behalf by the employer. Notably, for the past years, PAYE accounts for approximately 93 percent of the total PIT collections, whilst the remainder (7 percent) is constituted of non-salaried income tax.

Considering that employees' tax is reported through a third party (employers), it is relatively difficult to evade such taxes. Alm & Soled (2016: 22) pointed out that, under third-party reporting, it may take employees and employers to collude to evade taxes. However, collusion between employees and employers is generally not easy, especially in formal and/or large enterprises due to red tape (Alm & Soled, 2016: 22). Furthermore, due to the presence of a paper and/or electronic trail, under- or non-declaration of salaried income is easily detectable through an audit by the tax authority (see Paulus, 2015). This may suggest that salaried taxpayers have a high compliance rate, which may also suggest that this group of taxpayers constitute a smaller share of South Africa's PIT gap. However, the veracity of this conjecture remains an unresolved question.

Contrary to salaried income, non-salaried income (e.g. self-employed income, rental income, capital gains, donations and investment income) is reported through self-assessment, a mechanism whereby a taxpayer is tasked to make an own assessment of the tax liability and submit it to the tax

authority. This tax reporting approach provides the taxpayer with more control over his or her tax filing.

As previously noted, provisional taxes account for approximately 7 percent of the total PIT collections. The smaller share of provisional taxes in the total PIT may suggest that non-salaried income taxpayers have a combined lower income. On the other hand, the smaller share of provisional taxes in the total PIT may suggest that non-salaried income taxpayers have higher levels of non-compliance. For instance, considering that non-salaried taxpayers' determine their tax liability, and that they have some 'significant control' over their financial records through the self-assessment system, it is relatively easy to reduce their tax liability through manipulating figures (Schneider, 2005; Paulus, 2015). Most rental income, for example, may not be reported for taxes as it is difficult (or costly) for the authority to detect misreporting on such income. In some instances, taxpayers may avoid formal business channels, or may 'destroy' any paper trail to conceal their economic activities, making it difficult for tax authorities to trace any non- or under-reporting (Paulus, 2015; Artavanis, Morse & Tsoutsoura, 2016). Thus, it is relatively difficult to detect misreporting of self-reported income. This is affirmed by Alm, Deskins & McKee (2009: 121) who highlighted that non-salaried income bore a lower detection rate when compared to salaried income.

2.3   PIT AND NON-COMPLIANCE

Taxpayers tend to come up with measures that reduce their tax obligations, which ultimately reduces the revenue yield below its potential. There are broadly two ways through which individual taxpayers reduce their tax obligations: avoidance and evasion. Tax avoidance involves taking advantage of the tax code and exploiting loopholes within the tax statutes to reduce one's tax liability (Gcabo & Robinson, 2007: 358). Thus, tax avoidance involves engaging in activities that are legal but contrary to the spirit (or objective) of the tax law. For instance, individual taxpayers may engage in tax planning, for example splitting income in order to minimise tax liabilities by taking advantage of deductions and exemptions (Alm & Soled, 2016: 4).

On the other hand, tax evasion refers to the illegal and intentional actions by taxpayers to minimise or circumvent their tax obligations (Alm & Soled, 2016: 4). For instance, taxpayers may deliberately fail to file their returns. Some taxpayers may choose to underreport their income, or even conceal their sources of income. In other instances, taxpayers may decide to underpay, by paying an amount lower than they would have declared. Some taxpayers may overstate exemptions, deductions, or credits.

In South Africa, the proportion of individual taxpayers' returns (measured against the number of returns expected to be submitted) has been declining over the recent years, particularly from 2009/10 (see Figure 2.3). For instance, of the 4 987 491 million individual taxpayers expected to submit

returns for the 2009/10 tax year, 4 712 709 (94.5 percent) were assessed[3]. The proportion of assessed individual taxpayers' returns declined to 85.1 percent in 2013/14, and further slumped to 75.4 percent in 2015/16 (National Treasury and SARS, 2017: 36). The trend of the proportion of assessed individual taxpayers is depicted in Figure 2.2.
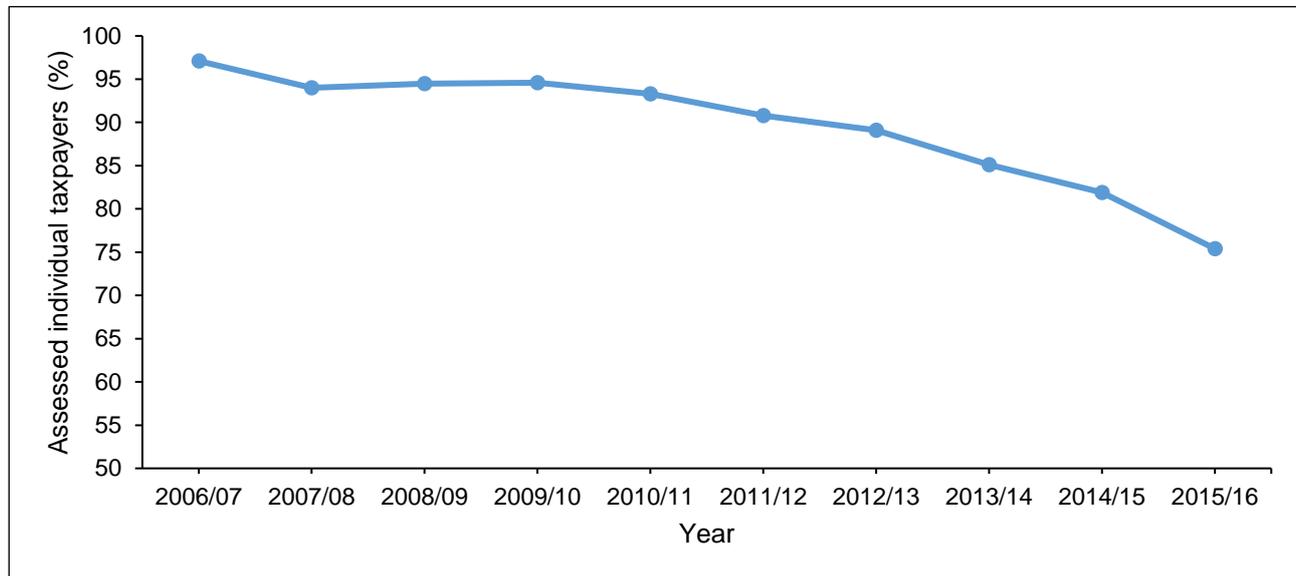
Figure 2.2: Assessed individual taxpayers, 2006/7 - 2015/16

Source: National Treasury and SARS, 2008, 2010, 2017.

The decline in the proportion of assessed (submitted) tax returns can be attributed to at least two factors: firstly, it may be due to an increase in the number of late filings and non-submissions. A decline in the proportion of submitted returns may therefore imply an increase in non-compliance. Secondly, considering that taxpayers whose earnings fall below the minimum tax threshold are not required to submit a return, the decline in the proportion of submitted returns may also be due to an increase in the number of taxpayers with earnings below the taxable threshold. However, the accuracy of these conjectures remain an empirical question.

2.4   MEASURES TO IMPROVE TAX COMPLIANCE

To stimulate compliance amongst taxpayers the government instituted several measures, which include improving the capacity to audit, introducing new penalties and offering reprieves to tax offenders, amongst others.

2.4.1   South Africa's penalty structure

Non-compliance is treated as a serious offence in South Africa. Depending on the nature and extent of the offence, tax evaders are subjected to financial penalties and/or serve a jail sentence. As specified in the Tax Administration Act No. 28 of 2011 (hereafter, the Tax Administration Act) South

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[3] The authority assesses all filed returns to determine the amount of tax to be paid. This implies that the number of assessed returns equals the number of filings in every tax year.

Africa has three forms of financial penalties: understatement penalties, non-compliance interest and administrative penalties (SARS, 2016a: 10). The administrative penalty regime was introduced in 2009 (SARS, 2016b: 406).

The understatement penalty varies with the nature of the offence. The Tax Administration Act classifies the tax offences into five categories:

- substantial understatement;
- reasonable care not taken in completing returns;
- no reasonable grounds for tax position taken;
- gross negligence; and
- intentional tax evasion.

Substantial understatement refers to an underpayment that is greater than 5 percent of the tax payable, or R1 million (SARS, 2013a: 79). Substantial under-declaration of income carries a penalty of 10 and 20 percent for standard (once-off) and repeated cases, respectively (SARS, 2016: 15). The penalty is calculated as a multiple of unpaid taxes. Importantly, these have not changed since their inception.

Failure to take 'reasonable care' in completing an income tax return carries a penalty of 25 percent for a standard case, and 50 percent for a repeated offence (SARS, 2016: 15). Although the Tax Administration Act does not provide for the definition of 'reasonable care', the tax authority defines an offence of having "no reasonable grounds for the tax position" as an underpayment of tax, due to the taxpayer's interpretation of the tax law (SARS, 2013a: 80). The offence constitutes a penalty of 50 and 75 percent for standard and repeated cases, respectively.

Gross negligence involves recklessness in tax reporting, but does not involve an intent to breach the tax requirement (SARS, 2013a: 79). The offence carries a penalty of 100 and 125 percent for standard and repeated cases, respectively.

The most severe penalty is preserved for cases where the taxpayer has acted with the intention to evade tax. This includes deliberate misreporting and a failure to submit a tax return. Intentional tax evasion carries a penalty of 150 and 200 percent for standard and repeated cases (SARS, 2016: 15). Table 2.1 summarises how understatement penalties are applied.

Table 2.1: Understatement penalty rates

Behaviour	Standard case	If obstructive[4] or if it is a repeat case
Substantial understatement	10%	20%
Reasonable care not taken in completing return	25%	50%
No reasonable grounds for tax position taken	50%	75%
Gross negligence	100%	125%
Intentional tax evasion	150%	200%

Source: SARS (2016: 15)

Besides underpayment penalties, non-compliant individual taxpayers are liable for interest, which is fixed at 9.75 percent per annum[5]. Further, depending on the gravity of the default, failure to comply with the requirements of the tax laws may constitute a criminal offence. Examples of criminal offences include intentional evasion, claiming undue refunds, or assisting a taxpayer in such endeavours (SARS, 2016a: 15).

The late submission of large numbers of PIT returns has been a major obstacle in SARS' drive to improve performance and raise the levels of compliance with the tax legislation (SARS, 2016b: 406)[6]. To rectify the situation, an administrative penalty was introduced in 2009. The administrative penalty consists of fixed amount penalties and percentage-based penalties. Fixed amount penalties are levied on individual taxpayers who fail to submit a tax return within the stipulated timeframe. These penalties are levied on taxpayers with outstanding tax returns for at least two years of assessment. Fixed amount penalties are calculated per month, at a fixed rate (thus, the penalty is a monthly rate). Depending on the individual's taxable income for the preceding year of assessment, the amount of the penalty ranges between R250 ($19) and R16 000 ($1 231)[7]. A cross-country analysis reveals that South Africa's penalty structures are comparatively stringent (see Section 5.4)

The administrative penalties are depicted in Table 2.2 (and have not changed since their inception). Apart from fixed-amount penalties, taxpayers are levied a percentage-based administrative penalty on the late or non-payment of taxes; this penalty is pegged at 10 percent of the back taxes.

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[4] An obstructive offence is committed when a taxpayer obstructs or hinders SARS official(s) in carrying their duties (SARS, 2016a: 11).
[5] This rate has not been changed since its inception.
[6] The reasons behind the upsurge in the number of late submissions are yet to be ascertained.
[7] R1 = $0.076 (01 March 2018).

Table 2.2: Administrative non-compliance penalties

Assessed loss or taxable income for previous year	Fine (monthly)
Assessed loss	R250
R0 - R250 000	R250
R250 001 - R500 000	R500
R500 001 - R1 000 000	R1 000
R1 000 001 - R5 000 000	R2 000
R5 000 001 - R10 000 000	R4 000
R10 000 001 - R50 000 000	R8 000
Above R50 000 000	R16 000

Source: SARS, 2016: 5.

Importantly, before the administrative penalties were enforced in 2009, the government publicised the new penalty regime widely, while providing taxpayers with the opportunity to file their outstanding returns to avoid the penalties (SARS, 2016b: 406). This initiative was supported by the modernisation of SARS through an automated process that levied and collected the penalties.

In view of the foregoing discussion, it is evident that South Africa relies heavily on penalties to deter taxpayers from evading. However, empirical studies on the effectiveness of such an instrument are diverse (see e.g. Gangl, Torgler, Kirchler & Hofmann, 2014; Modugu & Anyaduba, 2014; Mohdali, Isa & Yusoff, 2014; Park & Hyun, 2003; Slemrod, Blumenthal & Christian, 2001). A detailed discussion on the efficacy of penalties is provided in Chapter 5.

2.4.2   Administrative and institutional measures

A host of administrative and institutional measures had been introduced within SARS to improve the collection of PIT (and other taxes). The measures include modernisation of the tax authority and the rolling out of the taxpayer mobilisation programme.

Modernisation of SARS

In 2000, SARS rolled out a transformative programme 'Siyakha' (We Are Building), which was aimed at improving the efficiency and effectiveness of SARS in discharging its mandate (AfDBG, 2010: 17). Initiatives taken under Siyakha included recruitment of competent personnel and increased capacity to audit and prosecute non-compliant taxpayers. These measures sought to deter taxpayers from evading. However, empirical studies on the efficacies of such measures show diverse findings (see e.g. Slemrod *et al.*, 2001; Park & Hyun, 2003; Mohdali *et al.*, 2014). The discussion on the efficacy of deterrence measures is provided in Chapter 5.

The Siyakha programme also led to the modernisation of SARS, whereby the authority's operational processes were extensively automated to enhance administrative and compliance efficiency. It is under this modernisation programme that an e-Filing system was introduced in 2008 (SARS, 2016b:

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404). Before the modernisation programme, tax filing was burdensome to both taxpayers and the revenue authority. This was amplified by the fact that SARS would make hard copies of income tax forms (consisting of at least 12 pages each) and send them to taxpayers who, in turn, would also send them back to the authority filled in and with supporting documents attached (SARS, 2016b: 404). Thus, the filing system was byzantine and susceptible to gross errors. A taxpayer would send hard copies to SARS for verification whenever a query arose, a process that was cumbersome. As part of the modernisation programme, the size of the tax form was reduced to at least two pages. Further, the programme automatically generated monthly penalties and facilitated the collection of penalties (SARS, 2016b: 406), making it less costly to comply. Tambun & Kopong (2017) argued that low compliance costs may motivate individual taxpayers to increase their compliance.

The modernisation initiatives employed by SARS (such as the aforementioned e-Filing payment facility) has reduced the cost of collecting tax revenue[8] from 1.2 percent in 2009/10 to 0.93 percent in 2016/17, a ratio within the 1 percent internationally recommended benchmark (National Treasury and SARS, 2015: 11). Low costs in submitting returns is expected to reduce taxpayers' intrinsic motivation to avoid and evade taxes. Essentially, Tambun & Kopong (2017: 49) showed that e-Filing influenced individual taxpayers to increase their compliance levels. The trend of costs incurred by SARS in collecting taxes is depicted in Figure 2.3:
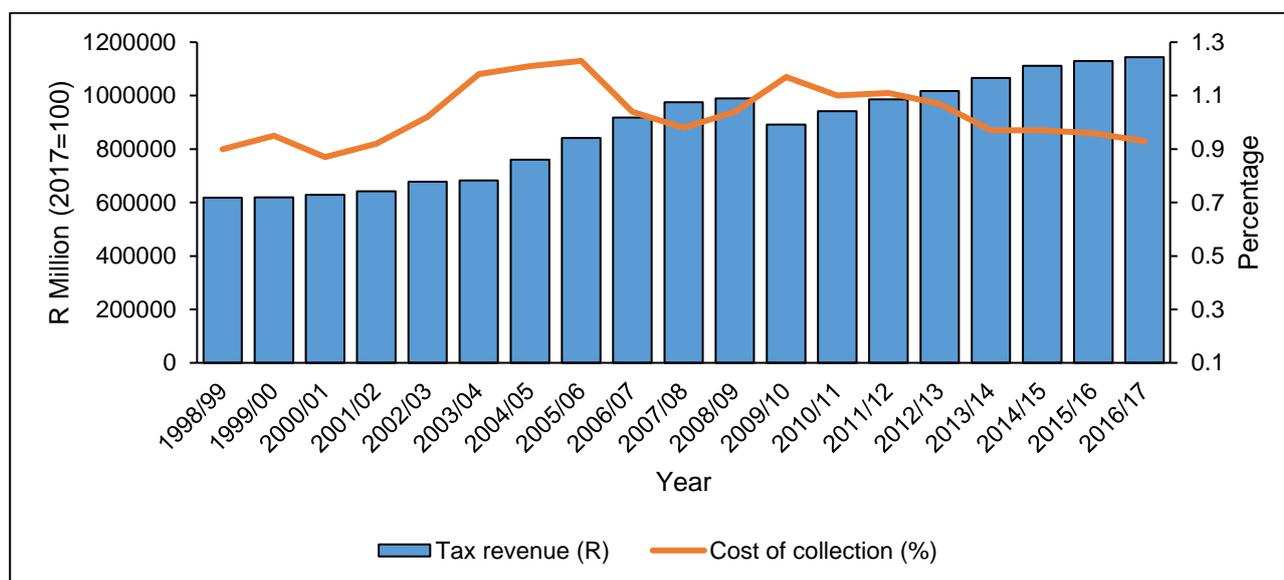
Figure 2.3: The cost of tax collections, 1998/99 - 2016/17

Source: National Treasury and SARS, 2016: 14.

The decline in the cost of collecting taxes is a result of an increase in efficiency in the submission and processing of tax returns. Since 2010/11, the value of payments done through e-Filing has been increasing. In the 2015/16 fiscal year, 75.9 percent of the total payments was undertaken through e-Filing, which is an 11.2 percentage point increase from 64.2 percent in 2011/12. The portion of

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[8] The cost of collecting revenue is the ratio of the revenue authority's cost of internal operations to total revenue authority.

payments undertaken at SARS branch offices declined drastically from 5.8 to 0.3 percent between 2011/12 and 2015/16. Likewise, tax payments done at banks have been declining over the past years. The increase in the portion of payments done through e-Filing seems to reflect findings from Kirana (2010) and Tambun & Kopong (2017) that this mode of payment causes taxpayers to increase compliance.

To improve the administration of queues at branch offices during tax seasons, SARS introduced an electronic queue management system, the Branch Queue Management System (BQMS). The BQMS uses mobile smart devices to issue tickets to the queuing taxpayers (SARS, 2016b: 409). The system reduced the average queuing times, in 2010, by 57 percent. The branch abandonment rate, which measures the number of people who leave SARS branches without being served, declined from 2 to 1 percent in the 2012/13 tax year (SARS, 2013b: 50).

Following the automation of the tax system, taxpayers can now observe their compliance status online and take corrective measures when necessary (without physically visiting SARS). The modernisation programme drastically improved the tax authority's administrative processes. The average processing turnaround time improved from 0.26 days to 0.16 days between 2012/13 and 2013/14, and further improved to 0.05 days in 2016/17 (National Treasury and SARS, 2017: 14). In 2007, before the introduction of the modernisation programme, only 2.6 percent of the PIT returns were processed within 48 hours. However, following the introduction of the programme, 94.5 percent of all the PIT returns were processed within three seconds during the 2016/17 fiscal year (National Treasury and SARS, 2017: 36).

To stem tax leakages, SARS introduced an advanced risk management system on the PIT system (and across all other tax heads), where present tax returns are analysed against the taxpayers' past returns, filing trends of similar taxpayers and third party information (SARS, 2016b: 406). Returns that are identified as "high risk" (i.e. susceptible to gross misreporting) are reviewed and if necessary, investigated. On the other hand, submissions that are identified as "low risk" were processed quickly and refunds were paid promptly. This initiative is commendable for not only improving SARS' proficiency in determining the accuracy of taxpayers' declarations but also increasing taxpayers' voluntary compliance.

Prior to 2014, SARS taxpayers would register for tax payments through the legacy registration process, which required a taxpayer to make separate registrations for PIT, VAT and customs taxes. This registration system was time consuming to both the taxpayers and the tax authority. There was gross duplication of information within the legacy registration process, which made it difficult for the authority to detect some misreporting and enforce compliance (Pietersen, 2014; SARS, 2016b). In order to counter these challenges, this process was revoked and replaced with a single registration process in 2014. With the single registration system, instead of registering each tax head or customs product separately, registrants' information is captured under one integrated profile. Any additional

tax products are added to the running profile. Under a single registration process, SARS personnel and taxpayers have a single view that provides a comprehensive picture of a taxpayer's relationship with SARS across all tax types and customs products (SARS, 2016b: 409). As part of the single registration programme, SARS intends to synchronise the individual taxpayers' database with that of the Department of Home Affairs and, at the same time, the database for corporate income taxpayers with that of the Companies and Intellectual Property Commission (CIPC). Thus, the new registration system was expected to improve SARS' administrative efficiency and curb identity fraud, making it difficult for individual taxpayers (and other taxpayers) to evade.

Taxpayer registration programme

In 2010, the tax authority rolled out the Individual Taxpayer Policy Registration (ITPR) programme, requiring all formally employed individuals to register as taxpayers, regardless of their tax liability. The programme was meant to bring non-filing taxpayers into the tax net. This drive drastically increased the number of registered individuals, from 5 920 612 in 2009/10 to 10 346 175 in 2010/11. Figure 2.4 shows the number of registered individuals for the period 2002/03 to 2016/17.
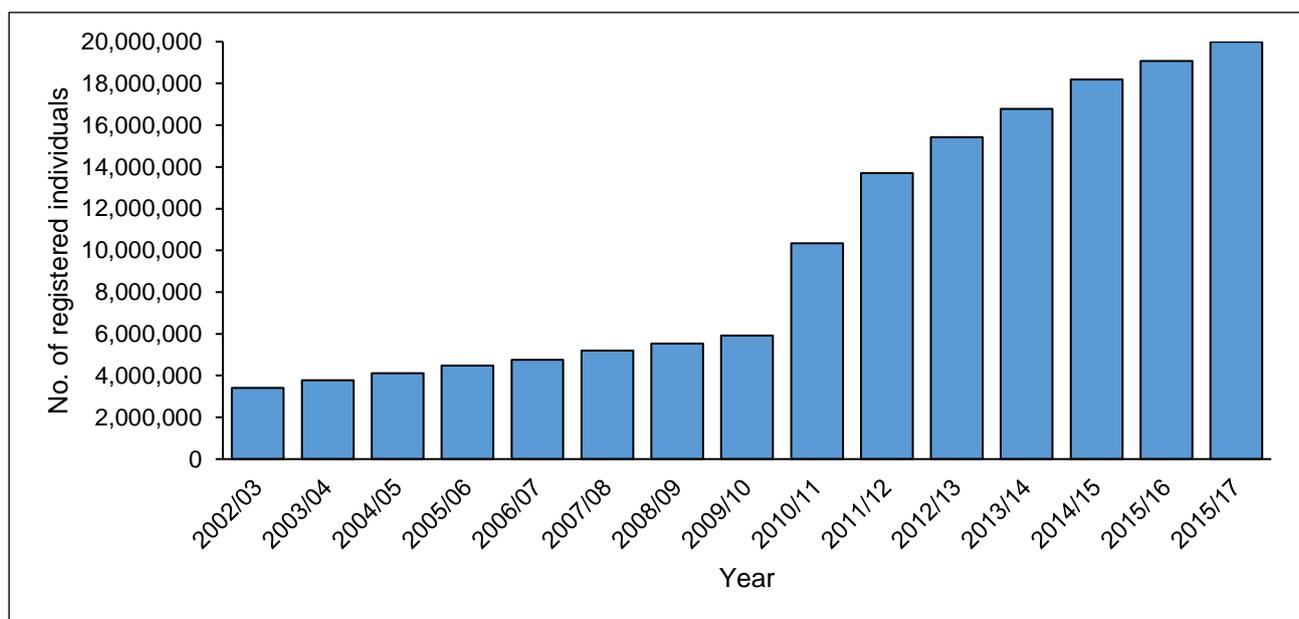
Figure 2.4: Number of registered individuals, 2002/03 - 2014/15

Source: National Treasury and SARS, 2009, 2010, 2015, 2017.

Since 2010/11, the number of registered taxpayers has been gradually increasing. For instance, registered taxpayers increased from 18.2 million in 2014/15 to 20.0 million in 2016/17. An increase in the number of registered taxpayers may lead to an increase in compliance, as former non-filers bear their share of the tax burden. Furthermore, the inclusion of non-filers into the tax net may tend to boost morale among compliant taxpayers, which may sustain voluntary compliance. The inclusion of tax delinquents into the tax system can be construed as a sign of commitment by the authorities towards reducing non-compliance, which may motivate taxpayers to increase their voluntary

compliance (Leonard & Zeckhauser, 1987; Bayer, Oberhofer & Winner, 2014). However, it would be essential to compare the extent of tax evasion before and after the ITPR programme to establish the effect of this drive on compliance. Unfortunately, estimates on the extent of evasion are (to the best of our knowledge) not yet available. As such, the effect of the ITPR on tax evasion remains to be ascertained.

2.4.3 Tax treaties, amnesties and VDPs

Following the adoption of the residence-based system, the government entered into a number of international agreements that sought to avoid double taxation, a situation whereby a taxpayer is taxed on the same income across two countries in the same tax year (Black *et al.*, 2015; National Treasury and SARS, 2015). Double taxation increases the tax burden, which may incentivise taxpayers to evade taxes in an endeavour to reduce the burden (Sandmo, 2005; Steenekamp, 2012b).

To date, South Africa has entered into several (approximately 73) double taxation agreements (SARS, 2018). The government has also entered into a network of agreements that sought to combat tax avoidance and evasion. For instance, the government adopted an inter-governmental model for automatic exchange of information, the Common Reporting Strategy (CRS) (see OECD, 2015; SARS, 2016a). In terms of this strategy, tax authorities are required to gather information from financial intermediaries from within 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. It also facilitated cooperation between governments, in ensuring that their respective residents were correctly assessed for tax. By May 2017, 89 countries had adopted the initiative, constituting over 500 information exchange agreements, of which eight are between South Africa and other countries (see SARS, 2018).

To increase voluntary compliance, the government also introduced a series of tax reprieves. The reprieves were in two forms: amnesties and VDPs. Under a typical amnesty, taxpayers are exempted from paying both the tax owed and any penalties associated with non-compliance. However, in a VDP regime, although taxpayers may be exempted from penalties, they would still be required to pay their previously unpaid taxes (Marino, 2015; Mastellone, 2015; OECD, 2015). For instance, in 1995, the government (through the Tax Amnesty Act of 1995) provided unregistered taxpayers an opportunity to enter the tax net at no penalty. The reprieve was open from 10 July to 31 October; this was later extended to 31 January 1996. The relief was limited to tax delinquents who were not on the tax register prior to 1 March 1994. In 1996, a second amnesty was introduced through the Final Relief on Tax, Interest, Penalty and Additional Tax Act. 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. However, the effect of these reprieves on compliance is yet to be examined.

Following the adoption of the residence-based tax system in 2001, South African residents were taxed on their worldwide earnings. However, since the early 1980s, significant amounts of funds had been moved offshore in a variety of ways; the income from these funds were not declared to the tax authority (SARS, 2016d: 417). To encourage taxpayers to disclose their unreported offshore incomes, 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. Under the amnesty, a two percent levy was imposed on the value of the back taxes (SARS, 2016d: 417). At the close of the window period, 42 672 applications were made, disclosing R68.8 billion worth of assets (SARS, 2016d: 417). The applicants paid levies amounting to R2.9 billion.

A tax system for small businesses (businesses with an annual turnover of a maximum of R10 million)[9] was introduced in 2001 and expanded over the years. During the process, the government identified "fear of exposure to penalties of past non-compliance" as one of the obstacles to improving voluntary compliance amongst small businesses (SARS, 2016d: 417). Subsequently, the government introduced the Small Business Amnesty and Amendment of Taxation Laws Act in 2006, providing amnesty to small businesses that voluntarily declared their unreported income and complied with the tax legislation (SARS, 2016d: 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. The move to shift from amnesties to VDPs was necessitated by the need to improve revenue, as delinquent taxpayers would be required to repay the tax owed in the VDP regime. The first VDP was introduced in 2010 as a pilot project, encouraging non-compliant taxpayers to voluntarily disclose their unreported income. The programme ran from 1 November 2010 to 31 October 2011. Those who voluntarily disclosed their 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 the reprieve covered all forms of tax fraud. These included the submission of inaccurate or insufficient information and the failure to file returns (SARS, 2012: 2). Most importantly, the reprieve was available to both onshore and offshore-undeclared incomes, regardless of how they were acquired. However, those who were already under investigation were not eligible to apply for the relief.

In 2012, the government re-introduced the VDP through an Act of Parliament, the Tax Administration Act 28 of 2011. This was meant to provide non-compliant taxpayers with more time to rectify their

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[9] Small business are not taxed under corporate taxes but under personal income taxes as they are largely owned by self-employed individuals. The small business sector constitutes formal and informal businesses. However, South Africa has a relatively smaller size of the informal sector compared to other developing countries (Schneider, 2014).

tax affairs. The reprieve was effective from 1 October 2012 and will be available for as long as the provisions are contained in the Tax Administration Act (SARS, 2016d: 418). In other words, the reprieve is open-ended (or permanent). Under this permanent VDP regime, taxpayers who voluntarily disclose their delinquencies would access relief in the form of reduced understatement penalty rates. 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 the event that the disclosure is done before the notification, a penalty that ranges between zero to ten percent is levied against the under-reported tax amount, and five to 75 percent when the disclosure is done after the audit notification (see Table 2.3). However, once granted a relief, the applicant is fully exempted from administrative penalties and criminal prosecution (regardless of whether the disclosure is made prior or after the notification).

Table 2.3: Understatement penalty rates

Behaviour	Standard case	If obstructive or if it is a repeat case	VDP after notification of audit	VDP before notification of audit
Substantial understatement	10%	20%	5%	0%
Reasonable care not taken in completing return	25%	50%	15%	0%
No reasonable grounds for tax position taken	50%	75%	25%	0%
Gross negligence	100%	125%	50%	5%
Intentional tax evasion	150%	200%	75%	10%

Source: SARS, 2016b: 15.

In 2016, following the introduction and adoption of the CRS, the government introduced another reprieve, the Special Voluntary Disclosure Programme (SVDP), which ran concurrently with the already existing (permanent) VDP (SARS, 2016e: 3). The SVDP was valid for 11 months, from 1 October 2016 to 31 August 2017. Unlike the permanent VDP that is open to both onshore and offshore asset holders, the SVDP was a once-off reprieve meant specifically for taxpayers with undeclared offshore income, and it was applicable only to individuals and companies. The 'special' reprieve was therefore meant to provide offshore income-holders an opportunity to rectify their tax status, pending an increase in enforcement (following the adoption of the CRS). However, as is the case with the permanent VDP, taxpayers were not eligible to apply for the relief if they were aware of an (pending) audit or investigation in respect of the foreign assets for which the relief was being sought. However, applicants were still eligible to apply for the relief if the investigation focussed on areas other than foreign assets in question (National Treasury, 2016).

Under the SVDP, 50 percent of the total amount used to finance the acquisition of the offshore asset (initial capital) before 1 March 2010 was taxable. Investment returns accrued from 1 March 2010 going forward were taxed in full at the standard tax rate. Furthermore, 40 percent of the value of the

total offshore assets derived from undeclared income constituted the taxable income. Successful applicants were fully exempted from administrative penalties and criminal prosecution (SARS, 2016e: 5). They were further exempted from understatement penalties, an additional benefit that was not provided for under the permanent VDP.

Despite their extensive application, tax reprieves are a controversial compliance-enhancement instrument. For instance, a reprieve may convince taxpayers that tax evasion is morally wrong, which may stimulate their intrinsic motivation to increase future compliance. (Fisher, Goddeeris & Young, 1989; Torgler, Schaltegger, Christoph & Svaffner, 2003). On the other hand, a tax reprieve can be regarded as an indication that authorities lack enforcement prowess to detect and punish those who evade (Alm & Beck, 1991; Luitel & Sobel, 2007). Under such circumstances, evaders may increase their non-compliance whilst honest taxpayers may be tempted to start evading. Torgler & Schaltegger (2005: 406) suggested that a reprieve may introduce an anticipatory behaviour among taxpayers so that, after a reprieve window, taxpayers may anticipate more reprieves in future, motivating taxpayers to reduce their tax loyalty. Importantly, the discussion on the efficacy of tax reprieves is provided in Chapter 6.

Notwithstanding all the efforts by the government to improve compliance levels, the scale and scope of the country's tax loss (tax gap) is unknown to SARS (DTC, 2014: 25). Intuitively, tackling the issue of non-compliance starts with understanding the size and structure (or composition) of the tax gap. Tax gap estimates may help in providing the reasons and circumstances behind non-compliance, which will aid the authorities in coming up with informed measures that reduce and prevent its occurrence (European Commission, 2016: 13). As such, lack of knowledge about the size and scope of the tax gap may compromise the effectiveness of compliance-enforcement measures. For instance, the authorities may fail to allocate resources where they are needed the most in enforcing compliance. Anecdotal evidence shows that knowledge about the size of the tax gap is useful in tackling non-compliance. For instance, the UK estimates its tax gap on an annual basis and knowledge drawn from these estimates have led to significant increase in compliance over the past years (Whicker & White, 2015; HMRC, 2018). For instance, the UK's tax gap declined from 7.3 percent of tax liabilities in 2006 to 6.3 percent in 2012 (HMRC, 2018: 4). It further declined to 5.7 percent in 2017.

2.5   CONCLUSION

PIT is the main source of revenue in South Africa. However, the tax head is characterised by a narrow tax base and high tax burden. This suggests that the scope for increasing individual income tax revenue through increasing tax rates is limited. Under such circumstances, one of the seemingly judicious and sustainable revenue-enhancement mechanisms is to ensure that everyone pays their tax dues. In view of this, the government has been instituting a host of measures to stimulate compliance amongst taxpayers.

Despite all the efforts to reduce non-compliance, the magnitude of the country's tax gap remains unknown to SARS. Knowledge about the tax gap helps the authorities to identify the areas that require more attention in enforcing compliance. For instance, the UK tax gap analysis showed that PIT contributed the largest share (approximately 33.4 percent) of the tax gap over the past years. Such information helps the authorities to allocate resources where they are needed the most in enforcing compliance.

In light of this discussion, the next chapter employs some micro-simulation models to estimate the size of South Africa's PIT gap, disaggregating it by the source of income (salaried and non-salaried) and by its components (i.e. compliance gap and policy gap). The disaggregated tax gap estimate may be useful in enforcing compliance.

CHAPTER 3

MEASURING TAX EVASION - TAX GAP ANALYSIS

3.1   INTRODUCTION

A tax gap is defined as the difference between the value of potential tax revenue and the actual collections, where potential revenue is the amount of tax which the government should collect if every taxpayer complies with the tax legislation (Toro, Ogata, Hutton & Caner, 2013: 14). It constitutes a revenue loss for the state, which may limit the government's efforts to fulfil its mandate. The tax gap can be a result of tax evasion, whereby taxpayers may, in contravention of the law, intentionally under-report their taxable income. Tax evasion includes under-reporting taxable income, overstating deductions and late or non-filing of tax returns (see Section 2.3). Apart from evasion, taxpayers may take advantage of legal loopholes within the tax system to reduce their tax liabilities, a phenomenon called tax avoidance.

There are essentially two broad categories of the tax gap: the compliance gap and the policy gap. The compliance gap refers to the value of revenue losses due to the impact of compliance-related issues. Ahmed & Rider (2013: 335) pointed out that, apart from deliberate misreporting, the compliance gap also arose from tax losses due to taxpayers' misunderstanding of tax legislation, tax authorities' poor record-keeping and other errors. The policy gap reflects the amount of revenue forgone by the government due to the impact of the policy (IMF, 2013: 11), and it constitutes tax forgone due to tax expenditures[10]. Technically, the policy gap is calculated by establishing the difference between the grand theoretical tax liability (the potential tax liability derived from gross income) and the theoretical liability derived from taxable income.

South Africa (like many other countries across the globe) is concerned about the need to stimulate compliance amongst taxpayers. As discussed in detail in Section 2.4, the government has been instituting several measures to minimise non-compliance over the past years. However, despite all the efforts to reduce non-compliance, the authorities have no solid evidence on the magnitude of the country's tax gap (DTC, 2014: 25). The European Commission (2016: 13) pointed out that tax gap estimates may help in providing the reasons and circumstances behind non-compliance, which will aid the authorities in coming up with informed compliance-enforcement measures. It is also argued that tax gap estimates are a useful first step towards controlling non-compliance and preventing its occurrence (Whicker & White, 2015; HMRC, 2018), implying that lack of knowledge about the size and scope of the tax gap may compromise the effectiveness of compliance-enforcement measures. For instance, the authorities may fail to allocate resources where they are needed the most in enforcing compliance.

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[10] Tax expenditures include preferential tax rates, special credits and exemptions.

Anecdotal evidence shows that knowledge about the size of the tax gap plays an important role in managing compliance. For instance, the UK calculates its tax gap on an annual basis to determine areas that need more attention. Their estimates show that PIT, national insurance contributions and capital gains tax contributes the largest share of the tax gap. However, compliance has generally been improving over the years, as evidenced by the decline in the tax gaps. For instance, the tax gap declined from 7.3 percent of tax liabilities in 2006 to 6.3 percent in 2012, and further declined to 5.7 percent in 2017 (HMRC, 2018: 4).

In light of the foregoing discussion, this chapter seeks to estimate the size of South Africa's PIT gap, disaggregating it by its nature (compliance and policy) and by the type of income (salaried and non-salaried). The chapter is structured as follows: Section 3.2 highlights the determinants of the tax gap. Section 3.3 discusses the different methodologies used to estimate the tax gap. Section 3.4 reviews the tax gap approaches. Section 3.5 provides an overview of the level of compliance in South Africa. Section 3.6 estimates the size of South Africa's PIT gap, disaggregating it by the type of income (salaried and non-salaried). Section 3.7 concludes.

3.2   DETERMINANTS OF THE TAX GAP

Factors that influence the tax gap are intertwined and are classified into four main categories: economic, institutional, social and individual factors (Sandmo, 2005; Cummings, Martinez-Vazquez, McKee & Torgler, 2009; Engida & Baisa, 2014).

Economic factors

Economic factors - in relation to tax compliance - refer to actions that are associated with the costs and benefits of performing the actions (Engida & Baisa, 2014: 434). Allingham & Sandmo (1972) assumed that taxpayers are utility maximisers, whose decision to pay taxes is arrived at after evaluating the costs and benefits of complying and evading. The tax compliance determinants that are associated with economic factors include tax audits, penalty rates and taxpayers' perception on government spending, amongst others (Torgler, 2003; Alm, 2012; Engida & Baisa, 2014). It is argued that taxpayers evade whenever they perceive that their non-compliance is undetectable and unpunishable. Thus, the frequency and thoroughness of audits, and the severity of the penalties associated with non-compliance, constitute the costs to evasion, which may stimulate tax compliance.

In addition, taxpayers, especially those who pay high amounts of tax revenue, are sensitive to how the government utilises the taxes received. They tend to increase their voluntary compliance if the government spends the public funds productively, for example on health and education (Engida & Baisa, 2014: 435). In contrast, taxpayers feel cheated whenever they perceive that the government is misusing the funds; they would therefore evade as a way to register their displeasure, thereby creating or expanding the tax gap.

Institutional factors

Apart from economic factors, taxpayers' compliance behaviour may also be influenced by institutional factors e.g. the role (or efficiency) of the tax authority in collecting taxes (Engida & Baisa, 2014; Tambun & Kopong, 2017). It is argued that high administrative costs (costs borne by the taxpayer to settle tax liabilities) play a significant role in influencing the tax gap. Engida & Baisa (2014: 435) found that administrative costs are positively correlated with non-compliance. For instance, difficulties in accessing tax forms may reduce taxpayers' intrinsic motivation to comply (due to high costs in accessing the tax form). The same applies when hard copies of tax forms are supposed to be physically submitted to tax offices that are far away from taxpayers (AfDBG, 2010; Sharoja, Kasipillai & Eza, 2014). In confirmation of this assertion, Tambun & Kopong (2017) found that the introduction of the e-Filing facility increased individual taxpayers' compliance levels by 53.9 percent in Indonesia. In light of the foregoing discussion, it is imperative for authorities to keep compliance minimal, which may include reducing registration (and submission) bureaucracy, amongst others (Palil, 2010; Sharoja *et al.*, 2014).

Social factors

Tax compliance determinants from a social perspective relates to taxpayers' willingness to comply with the tax legislation in response to other people's behaviour and their social environment (Cummings *et al.*, 2009; Alm & Torgler, 2011; Engida & Baisa, 2014). For instance, taxpayers and the state are bound by a social (or psychological) contract, and compliance is therefore influenced by this contractual relationship. Thus, even if there is no risk of being detected or punished, taxpayers may voluntarily comply as long as the government operates in a manner that meets their expectations (Torgler, 2003: 30). In the same vein, taxpayers' compliance decisions may also be determined by how taxpayers trust their government (i.e. political legitimacy). In cases where taxpayers perceive their government as illegitimate, they may show their discontentment by avoiding and evading taxes. In line of this assertion, Alm, Martinez-Vasquez & Torgler (2010) also found that there is a positive correlation between political legitimacy and compliance, implying that taxpayers increase their compliance levels when they regard their government as legitimate. Apart from political legitimacy, Alm *et al.* (2010) also found that taxpayers' compliance behaviour may also be influenced by the behaviour of others within their social environment. More specifically, they found that when evasion is widespread, taxpayers might regard non-compliance as a social norm, which reduces their intrinsic willingness to comply with the tax laws. In light of this discussion, it is imperative for the authorities to consider social factors as well when enforcing compliance.

Demographic and incidental factors

In addition to the afore-mentioned factors, taxpayers' compliance decisions are also influenced by personal factors such as demographic and incidental variables. Engida & Baisa (2014: 437) highlighted that, in the case of immense budgetary constraints, individuals may give priority to basic

needs at the expense of tax payments, thereby creating or widening the tax gap. The OECD (2013) and Engida & Baisa (2014) pointed out that gender also plays a significant role in influencing compliance. These studies found that female taxpayers had a higher tax morale than men. Age is another demographic factor that was found to be positively associated with compliance, with older taxpayers more compliant than younger people. The OECD (2013: 3) further highlighted that religion does influence compliance patterns. More specifically, the study found that taxpayers who claim a faith or religious identity have more political will toward paying taxes.

Education level and the nature of employment (formal or informal) have a bearing on taxpayers' compliance decisions. Taxpayers with a higher level of education are found to comply more than those with lower educational qualifications (OECD, 2013; Engida & Baisa, 2014). Furthermore, those who are formally employed comply more than the informally employed. This is because better educated and formally employed individuals understand the filing processes better than the less educated and informally employed ones (Engida & Baisa, 2014; Gitaru, 2017).

3.3   TAX GAP METHODOLOGIES

There are, broadly, two approaches to measure the tax gap: the top-down and the bottom-up approaches. The top-down (or macro) approach relies on macro-economic data and the theoretical tax liability is calculated from a single estimate of the tax base (Rubin, 2011: 109). Toro *et al.* (2013: 33) indicated that, to estimate reliable tax estimates using this approach, the data to be used must be representative enough of the tax base. They further highlighted that such data had to be derived from sources other than taxpayers' records, the advantage of such data being its independence from intentional misreporting by taxpayers. Other benefits include that the approach is simple and, due to the timeous release (or production) of national data, this approach is capable of producing timely estimates too.

Fuest & Riedel (2009: 16) categorises the top-down approach into two classes: the macro-indicator and macro-accounting. The former uses macro-indicator variables such as monetary and physical-input demand to calculate the size of the underground economy[11], which is then extrapolated to represent the size of the tax gap. On the other hand, the macro-accounting method is premised on the exploitation of data from national and financial accounts.

The use of the money-demand method is based on the assumption that transactions in the informal sector are largely undertaken in cash, to conceal any traceable record from the authorities (Schneider, 2005; Fuest & Riedel, 2009). The over-dependence on cash in the shadow economy creates "excess demand" for cash (Lackó, 2000; Poesoro, 2015). To isolate the excess demand for currency, an equation for the money demand is estimated over time, factoring in all conventional

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[11] Underground economy refers to all goods and services that are produced and intentionally hidden from tax agencies to evade taxes. Thus, the size of the underground economy can be viewed as the size of the tax gap. It does not also account for the policy gap.

factors of money demand, such as the development of money, interest rates and payments habits. Any excess increase in money demand that is not accounted for by the conventional factors of money demand is assumed to be the size of the tax gap (Schneider, 2005 : 622).

The physical-input method (the electricity approach) is underpinned by two assumptions. Firstly, the amount of electricity consumed in the shadow economy is assumed to be the same as in the formal economy. Secondly, "the elasticity of electricity consumption to GDP" is assumed to be one (Fuest & Riedel, 2009: 18; Kemal & Qasim, 2012: 508). From these assumptions, the growth in electricity consumption is assumed to tally with the growth in GDP. Thus, the size of the hidden economy (or tax gap) is estimated by tracking the trend of aggregate electricity consumption and GDP. More specifically, the discrepancy between the growth rates of electricity consumption and GDP is assumed to be the growth rate of the hidden economy. In aggregate terms, the shadow economy (or tax gap) is reflected by the discrepancy between total electricity consumption and the official measure of GDP.

The macro-accounting method calculates the tax gap using data from national and financial accounts. The size of the tax gap is estimated by establishing the difference between national household income and expenditure amounts (Fuest & Riedel, 2009: 18). Contrary to the currency and physical-input demand methods that determine an all-inclusive tax gap, the macro-accounting method allows for the determination of tax gaps for specific tax measures. This approach is, however, criticised for its failure to account for tax gap overlaps. For instance, any unreported sale constitutes the VAT gap, whilst at the same time it generates an unobserved income from work, thereby creating a tax gap in respect of personal income. In such circumstances, there is a risk of double counting (Fuest & Riedel, 2009: 19).

In some instances, researchers use a Dynamic Multiple Indicators Multiple Causes (DYMIMIC) model to estimate the size of the tax gap (see Schneider & Klinglmair, 2004; Gemmell & Hasseldine, 2012). The DYMIMIC model assumes that there is a direct link between the amount of hidden income and other variables, for example cash in the economy. It further assumes that the hidden income is capable of being partially captured by at least two indicator variables (such as currency and GDP). The hidden income is also assumed to be associated with at least two causal variables: tax rates and labour market regulations (Gemmell & Hasseldine, 2012: 10). The size of the hidden income (which is treated as a latent variable) is then calculated by estimating parameters of the casual and indicator variables, through a regression model. However, Gemmell & Hasseldine (2012: 10) highlighted that, due to the nature of the regression methods, residuals of time-series are often found to have a zero mean, implying a negative hidden economy, which is meaningless.

In summary, macro-approaches have some fundamental shortcomings. For instance, they provide a single broad estimate of the tax gap, thereby providing little insight on the nature and causes of the tax gap. More precisely, macro-approaches are not capable of estimating the tax gap by its

components. For instance, it does not disaggregate the tax gap by the type of income (e.g. salaried and non-salaried). Such an estimate does not adequately capacitate the government in assessing its performance in the collection of revenue. An all-encompassing estimate also provides little guidance on how to reduce the tax gap. In fact, tax gap estimates from macro-approaches provide little insight on how to improve compliance. In addition, equating the size of the shadow economy to the extent of tax evasion is seemingly flawed, as the two are different. The shadow economy estimates may overstate the tax gap. This is because the shadow economy includes activities such as fraud, smuggling, trading of stolen goods and production and distribution of prohibited goods, which may not be taxable even if they are detected (as they are illegal) (Fuest & Riedel, 2009: 51). Thus, shadow economy estimates cannot reliably represent the extent of a country's tax gap.

In order to circumvent shortcomings of the top-down approach, many researchers prefer the bottom-up approach (micro-approach). This approach does not depend on the value of a single estimate of the tax base (Rubin, 2011: 111), neither does it rely on macro-economic data (Fuest & Riedel, 2009: 20). The main advantage of this technique is that it establishes the tax gap by its components: its nature (compliance and policy), the type of income, the sector of the economy and, in some instances, by causes of the gap. It is further credited for its capability in estimating tax gaps from any type of income (see Ahmed & Rider, 2013). The estimation technique uses individual-level (micro) data to determine the size of the tax gap, and such data are obtained from tax audit records and surveys. For instance, Her Majesty's Revenue and Customs (HMRC)[12] uses audited data to calculate the tax gap (the compliance gap and the policy gap). The compliance gap is estimated by deducting the actual collections from the potential revenue the authority should collect if everyone complies and consists of the revenue loss arising from under-reporting and non-filing. On the other hand, the policy gap is calculated by establishing the difference between the grand theoretical tax liability (the potential tax liability derived from gross income) and the theoretical liability derived from taxable income. In respect of direct taxes, the HMRC employs a three-pronged bottom-up approach: inquiries, data matching and risk registers. Whicker & White (2015: 13) highlighted that the choice of this method is highly dependent on the type of data available. Under the random enquiry programme, taxpayers are sampled at random and are subjected to full enquiries by HMRC officers, verifying whether they truthfully reported their incomes. Results from this exercise reveal the tax gap due to under-reporting. In order to estimate the overall level of under-reporting, the estimated tax gap from the audited sample of tax returns is weighted up to the actual size of the taxpayer population, using the relative amount of the tax liability (IMF, 2013: 51). The random enquiry programme does not, however, cover larger corporates and partnerships[13]. Nevertheless, tax gaps in these institutions are extrapolated from similar taxpayers, whose level of non-compliance is determined through the random enquiry programme (IMF, 2013: 51). Whicker & White (2015: 55)

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[12] The HMRC is the revenue authority for the UK.
[13] In this context, large corporates and partnerships are businesses with at least 250 employees and 5 partners, respectively (Whicker & White, 2015: 56).

also noted that the random enquiry program does not capture all inaccuracies in the tax returns. This is because audit data is generally confined to those taxpayers who are within the tax net. In order to detect non-filers and under-reporters, additional data must be obtained from third parties (other data from outside the internal tax records). However, data from third parties are usually unavailable, making it difficult to verify the accuracy of the tax returns data. Thus, the level of the tax gap estimated under the random enquiry programme is generally lower than the actual value.

Apart from the random enquiry programme, the HMRC matches taxpayers' reported income against their respective information from bank records, an exercise called data matching. The discrepancy between the reported amount and that from the bank records is the undeclared income (or the tax gap). Lastly, the HMRC "maintains a risk register of identified avoidance schemes" (Whicker & White, 2015: 56). A compliance yield is estimated based on the magnitude of the risks and, in order to establish the extent of the tax gap due to avoidance, the estimated compliance yield is deducted from the overall theoretical tax liability (calculated on taxable income). Importantly, HMRC estimates the tax gap on an annual basis and the results show that the UK's tax gap constituted about 6.2 percent of the total theoretical tax liability, on average. The tax gap has been declining since 2013.

The trend of the UK's tax gap expressed as a percentage of the theoretical tax liability for the period 2005/06 to 2016/17 is depicted in Figure 3.1:
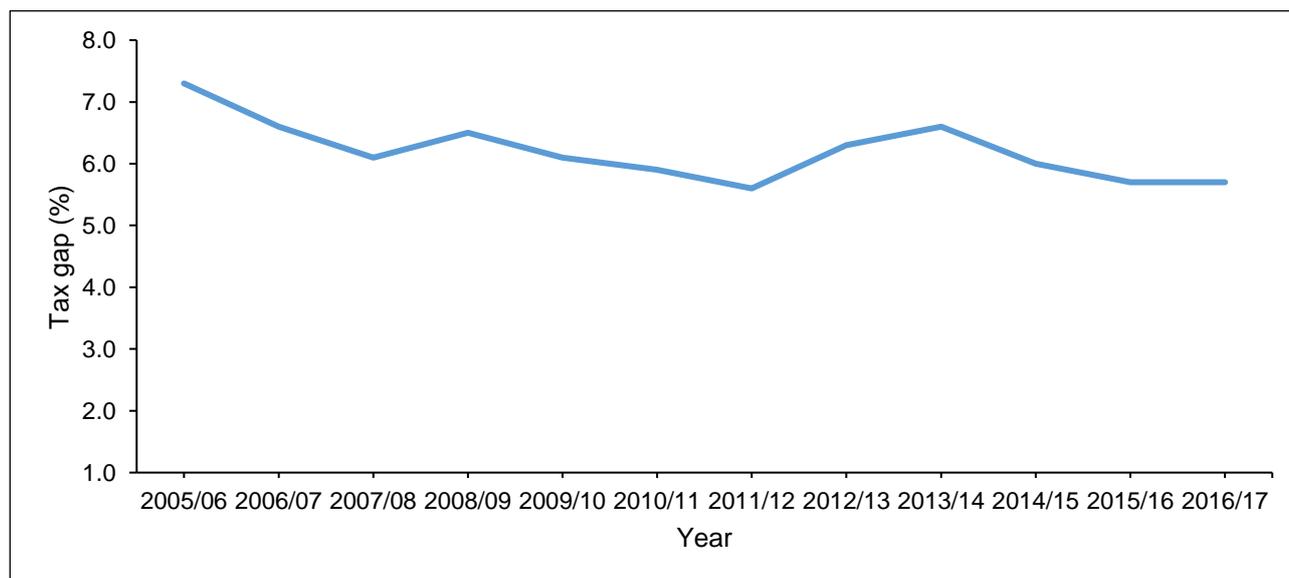
Figure 3.1: Tax gap as a percentage of theoretical tax liabilities, 2005/06 – 2016/17

Source: HMRC, 2018: 4.

The HMRC (2018) also found that PIT, National Insurance Contributions and capital gains tax collectively contributed the largest share (approximately 33.4 percent) of the tax gap in 2016/17. It is also established that self-assessment taxpayers constituted the largest share (about 23.9 percent) of the tax gap (HMRC, 2018: 52). The HMRC tax gap analysis further disaggregates the tax gap by the nature of non-compliance. It was found that taxpayers' failure to take reasonable care when filing

contributed the largest share (17.7 percent) of the tax gap in 2016/17. In light of the foregoing discussion, it is evident that the HMRC's approach provides a comprehensive analysis of the tax gap. Furthermore, the HMRC's approach is credited for providing more accurate estimates of the tax gap, and few other countries are currently applying it as well. It would be important for other tax authorities to adopt such an approach to estimate tax gaps in their respective jurisdictions.

Information from income and expenditure surveys can also be used to estimate income tax gaps. Survey data are used to estimate the theoretical liability of all sampled individuals. The theoretical liability will be in two forms, one inclusive of the tax policy and the other excluding the tax policy. The calculated potential liabilities are then scaled up to the entire population using sample weights from the survey dataset. To establish the policy gap, the theoretical liability that accounts for the tax policy is deducted from the theoretical liability calculated from the gross income. To establish the compliance gap, the actual tax collections are deducted from the theoretical liability calculated from the taxable income[14].

Survey data is credited for its independence from deliberate misreporting by taxpayers. However, surveys are costly to conduct. Fuest & Riedel (2009: 20–21) also highlighted that one of the major challenges when surveying taxpayers is the unwillingness of the respondents to truthfully report their income. It is pointed out that there is a risk that respondents (especially high income earners) would under-report their incomes and concomitantly over-report expenditures. These challenges pose the risk of under-estimating the theoretical tax liability and, consequently, the tax gap.

3.4   EMPIRICAL APPLICATIONS OF THE TAX GAP APPROACHES

The estimation of tax gaps is still uncommon; as such, there are few available empirical studies. This section reviews these studies according to their categories (the top-down and bottom-up).

3.4.1   Top-down approaches

In calculating the tax gap in respect of consumption-based taxes (indirect taxes), the HMRC employs the top-down methodology (Whicker & White, 2015: 13). The authority uses external consumption expenditure data (published by the Office of the National Statistics) to estimate the theoretical tax liability. The compliance gap is then calculated by subtracting the actual collections from the theoretical tax liability (calculated from the taxable income). This approach is more likely to provide an estimate of the potential revenues, including from activities unknown to the tax authorities (Toro, Ogata, Hutton & Caner, 2013; HMRC, 2018). However, as previously highlighted, this approach cannot be applied on direct taxes. This is because the effective tax rate of direct tax varies substantially across the population of potential taxpayers, depending on a wide range of factors for which independent data often does not exist (Toro et al., 2013: 14). Furthermore, this estimation

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[14] The application of the survey data in estimating gaps is discussed in detail in Section 3.6.1.

technique establishes a single estimate of the tax gap, hence providing little insight on the reasons behind the existence of the tax gap.

In some instances, researchers estimate the size of the tax gap from the size of the shadow economy. For instance, Schneider & Klinglmair (2004) used the physical-input (electricity), currency demand and the DYMIMIC model to estimate the extent of revenue of revenue loss for 110 countries. The study found that, on average, developing countries lose tax revenue amounting to 41 percent of GDP. It further established that South Africa loses tax revenue worth about 28.4 percent of its GDP (Schneider & Klinglmair, 2004: 6). However, considering that other activities in the underground economy (high-income professionals and service industries, for example) do not require a considerable amount of electricity, the physical-input (electricity) method is susceptible to an underestimation of the size of the shadow economy. Furthermore, considering that some of the activities in the shadow economy are untaxable, interpreting the extent of the shadow economy to mean the size of the tax gap could be misleading. As previously discussed, this is because the shadow economy includes illegal activities such as fraud, smuggling, trading of stolen goods and distribution of prohibited items. When detected these activities are stopped, and so do not generate any tax revenue. Thus, the inclusion of illegal (untaxable) activities tends to over-estimate the tax gap. Auriol & Michel (2005) argued that, in some instances, the existence of shadow economies is a result of governments' efforts to empower their citizens. They further argued that this is common, especially in some developing countries, where the state designates certain sub-sectors of the economy to the less privileged as a welfare enhancement initiative. Fuest & Riedel (2009) and Auriol & Michel (2005) pointed out that under such circumstances, formalising the shadow economy would not generate additional tax revenue, neither would it be in the national interest.

Using a DYMIMIC model, Cobham (2005) used existing data on the size of the underground economies to estimate the amount of tax losses incurred by developing countries. The study established that developing countries collectively lose approximately $385 billion worth of tax revenue on an annual basis, due to the presence of shadow economies (Cobham, 2005: 12). However, the study did not provide the magnitude of the tax gaps by country, let alone by type of income. Such estimates provide little information on how to improve compliance.

3.4.2   Bottom-up approaches

The United States' revenue authority, the Internal Revenue Service (IRS) estimates its tax gap using the bottom-up approach. The agency has a random audit programme, the National Research Programme (NRP), under which a sample of 46 000 individual income tax returns are randomly selected for an audit (Fuest & Riedel, 2009: 21). These returns typically receive thorough audits to estimate the theoretical tax liability, which will then be matched against the actual collections. Importantly, random audits usually fail to capture all non-compliance, which may reduce the theoretical tax liability and ultimately the tax gap. To cater for this challenge, the IRS employs a

statistical procedure known as the Detection Controlled Estimation (DCE). With the DCE, the audit process is jointly modelled with the causal breach of compliance in order to calculate weightings (Dubin, 2012: 10). The results of this process are then used to adjust the audit results to account for potential non-detection. The estimated tax gap from the audited sample is extrapolated to the overall taxpayer population and aggregated (Fuest & Riedel, 2009; IRS, 2012). The application of the DCE strengthens the IRS' random enquiry programme. This statistical procedure minimises the chances of under-estimating the level of non-compliance. It is, however, sophisticated and costly.

To calculate the United States' estate tax[15] gap, Feinstein (1999) used asset data from two data sets, the Health Retirement survey data and the Assets and Health Dynamics Among the Oldest Age. From this data, the distribution of private assets was established. Information derived from the asset distribution was then used to estimate the number of tax files which were supposed to have been submitted to the tax administration. The potential number of tax files were calculated based on the number of recorded deaths. The study established that approximately 30 000 tax files were not submitted (Feinstein, 1999: 368). However, in coming up with this figure, the relationship between mortality risk and socio-economic status was not factored in; the poor are more prone to a higher mortality risk than the rich. Such a relationship was not catered for in this study. Failure to factor in such a relationship may underestimate the tax gap.

Artavanis, Morse & Tsoutsoura (2016) used individual-level data on household credit from a bank to measure the level of personal income tax evasion in Greece. The approach was built on the assumption that access to personal bank loans in a semiformal-economy (like Greece) is largely dependent on the applicant's financial soundness. In order to access loans, borrowers would truthfully reveal their income to banks. The credit dataset therefore contains authentic individual income levels. Artavanis *et al.* (2016) replicated the banks' underwriting model in order to deduce individuals' true income in line with the banks' assessment. Focussing on non-salaried taxpayers, Artavanis *et al.* (2016: 5) established that Greece's tax gap amounted to 30 percent of the national deficit. The tax gap was found to be mainly constituted by "highly educated and powerful individuals", who hold the majority seats in Parliament (Artavanis *et al.*, 2016: 56). Importantly, the study focussed on non-salaried taxpayers on the assumption that salaried workers had lower chances of evading, since they report through employers (third-party reporting). It would however be essential to include non-salaried income in the investigation to obtain a comprehensive estimate of the personal income tax gap.

However, in semi-formal economies (such as Greece) that are characterised by a large number of small companies, it is possible that workers collude with employers to evade taxes. It is therefore possible that this measure under-estimates the magnitude of the Greece's personal income tax gap.

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[15] This is the tax paid on the transfer of the deceased person's estate.

Paulus (2015) used household survey and tax data to estimate the level of under-reporting in respect of personal income in Estonia. The study estimated the tax gap by establishing the discrepancy between income and expenditure. The model was built on the assumption that people accurately report their expenditures, since there is generally little incentive to misreport them. Paulus (2015: 4) therefore attributed any unusual discrepancies between income and expenditures to under-reporting. The study found that, on average, self-employed and privately employed individuals under-reported 20 percent and 7 percent of their income, respectively. Thus, self-employed households evaded more than privately employed employees. Paulus (2015: 24) attributed high non-compliance by self-employed employees to their reporting mechanism (i.e. self-assessment), arguing that such reporting provided taxpayers with more opportunities for misreporting. Paulus (2015: 15) highlighted that the Estonian Social Survey (ESS) data used in this study, however, had limited information on expenditure. Given the poor quality of the data, it was doubtful if the findings reflected the true extent of the level of individual taxpayers' under-reporting.

Ahmed and Rider (2013) employed micro-simulation models to estimate the tax gap for Pakistan for the 2004/05 fiscal year. The model consisted of a tax calculator[16] and comprehensive data for the different types of taxes. A tax calculator, which is a computer program that performs the mathematical calculations to estimate the tax liability, was constructed in line with the requirements of the tax legislation. The study used the Household Integrated Expenditure Survey (HIES) and the Labour Force Survey (LFS) datasets to estimate the PIT gap.

The HIES dataset consisted of 14 776 households, drawn from 1 045 sampling units, and thus the data was nationally representative. In the HIES, individual income was reported by type. More specifically, the individuals reported their income by type of work, whether privately or self-employed. The respondents also reported their earnings for the past month and the number of months they worked in the past year. Such household level data accounted for both the tax bands and progressive rate structure of the PIT (Ahmed & Rider, 2013: 340). Using the calculator, the tax liabilities were established from the individuals' taxable wage income. The estimated tax liabilities were aggregated and grossed up to national levels, using the inverse of the sample weights. The potential tax liability from salaried income earners amounted to Rs39 billion (US$0.38 billion) against the actual tax collections of Rs13.3 billion (US$0.13 billion), resulting in a tax gap of US$0.25 billion, which is 65.8 percent of the potential tax revenue. Following the same procedure, the tax gap of non-salaried taxpayers was found to be 13.2 percent of the theoretical tax liability.

Ahmed & Rider (2013) also used the LFS data to estimate Pakistan's PIT gap, arguing that this dataset provided more comprehensive information on individual income than the HIES dataset. The data was gathered from a sample size of 18 912 individuals, which was larger than the HIES sample

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[16] Tax calculators can be programmed in Fortran, C++, SAS, Stata, SPSS, and even MS Excel spreadsheets. The choice of software depends on the volume of data and the nature (or structure) of the tax legislation.

size. Furthermore, the survey was spread over the four quarters of the year to account for seasonal variations in income. Using the same procedure employed on the HIES dataset to estimate the tax gap, Ahmed & Rider (2013) established that the tax gap by salaried taxpayers constituted approximately 97 percent of the actual tax revenue collections. The LFS dataset could, however, not be used to estimate the tax gap in respect of non-salaried income taxpayers. This is because their earnings were not captured in the dataset (Ahmed & Rider, 2013: 343).

3.5   THE SOUTH AFRICAN TAX GAP

Oberholzer & Stack (2009: 738) pointed out that a figure of R30 billion had been quoted in the press as the extent of South Africa's tax gap for the year 2002. Although the nature or composition of the tax gap is not known with certainty, Oberholzer & Stack (2009: 737) highlighted that non-compliance could be the main source of the tax leakage. In his study on the attitudes of South Africa taxpayers towards taxation, Oberholzer (2008) found that the majority of South Africans were of the view that the government used tax revenue in a manner that did not benefit the nation. This finding was confirmed by Oberholzer & Stack (2009) who found that the majority of South Africans perceive the government to be wasteful and corrupt. Oberholzer & Stack (2009) therefore suggested that non-compliance could be due to taxpayers' negative perception about the state. Oberholzer & Stack (2009: 753) therefore recommended that SARS undertake a comprehensive education exercise, to both existing and potential taxpayers, on how tax revenue is spent. This would influence taxpayers towards having a positive perception of the state on how it spent public revenue.

Citing what they referred to as "informants" from within SARS, the AfDBG (2010: 39) highlighted that South Africa's tax gap for the 2007/08 fiscal year ranged between R25 billion to R35 billion. However, the study did not reveal how the tax gap figure was calculated, neither did it reveal the source (composition) of the tax gap. Notably, a single estimate of the tax gap is less informative in providing guidance on how non-compliance can be controlled.

Venter *et al.* (2010) used survey data on household income and expenditure from the Bureau of Market Research to calculate South Africa's personal income tax gap. Using a micro-simulation model, the tax gap was established by deducting the National Budget's estimate on tax revenue from individual taxpayers, from the estimated theoretical tax liability. A figure of R9.7 billion (about 4.5 percent of the potential tax revenue) was established as the size of the PIT gap for the 2008/09 fiscal year. However, the study did not establish the sources of the gap. More so, considering that the tax gap is technically the difference between the theoretical and actual tax collections, benchmarking the potential tax liability against the estimated revenue from the National Budget might produce misleading estimates of the tax gap. Budget statistics are estimates, and often they are greater than the actual figures realised at the end of the fiscal year. Contrasting the theoretical tax liability against the estimated tax revenue from the National Budget may overstate the tax gap. It is therefore doubtful if the calculated size of the tax gap was accurate. Further, the study did not disaggregate the tax gap

by the source of income (salaried and non-salaried). Such an estimate is less informative. It is therefore imperative to come up with a tax gap estimate that reveals the source of the tax leakages.

In its 2014 interim report, the Davis Tax Committee pointed out that the definite size of the tax gap was still unknown to SARS. The report further highlighted that the establishment of the country's tax gap was vital to policy design. It was against this observation that the Committee recommended that SARS adopt the HMRC's tax gap analysis programme[17] (DTC, 2014: 25).

Concerning the composition of the tax gap, Paulus (2015: 3) argued that, given that remuneration income tax is paid through third-party reporting, chances of under-reporting were likely to be relatively minimal. This argument was based on the fact that circumvention of the third-party reporting system strongly depended on the prospects of employees conniving with their employers, making it relatively difficult to dodge the system.

Contrary to PAYE, tax on non-remuneration income is paid through self-reporting. Paulus (2015: 21) argued that provisional taxpayers had more opportunities to under-report their income when compared to other taxpayers - taking advantage of the fact that their incomes were not taxed at the source (third-party reporting). Wu & Teng (2005: 401) also supported the notion that provisional taxpayers had more opportunities for manipulating their gross incomes to reduce their tax liabilities. They argued that non-salaried income was not closely administered by the tax authority, as is the case with other incomes, thus providing non-salaried income earners more opportunities to misreport. Venter *et al.* (2010: 68) also argued that, apart from deliberate misreporting of income, non-salaried income earners had more opportunities to be non-compliant. For instance, unlike employees who file their returns through their employers, non-salaried income earners may lack the knowledge on how to fill in the tax returns, which may compromise the accuracy of the information in their returns. Due to lack of income, they may not be able to afford to hire professional tax consultants to assist them in filing. It is also suggested that non-salaried income earners are more prone to be affected by poor cash flows, which may affect their planning and ultimately influence them to misreport (Venter *et al.*, 2010: 68).

3.6   CALCULATING SOUTH AFRICA'S PERSONAL INCOME TAX GAP

To manage compliance effectively, it is essential to have knowledge about the tax gap. In this study, a bottom-up estimation approach is employed to estimate South Africa's tax gap in respect of PIT. For a reliable estimate of the potential tax liability, an objective measure of the tax base is required (Ahmed & Rider, 2013: 339–340). It is in this regard that individual-level survey data (that is nationally representative) can be ideal for estimating the PIT gap. However, such data is susceptible to misreporting, especially by the self-employed and the high-income earners (see Ahmed & Rider, 2013: 343).

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[17] Under this programme, the extent and source(s) of the tax gap are estimated and published on an annual basis.

3.6.1   Data and Methodology

Following the methodology of Ahmed & Rider (2013), this study used the Income and Expenditure Survey data of 2005/06 and 2010/11 to estimate South Africa's PIT gap. Statistics South Africa (StatsSA) conducts the Income and Expenditure Surveys (IES) every five years and its primary task is to capture household consumption data for the purpose of updating the consumer price index (StatsSA, 2012: 1). The 2005/06 and 2010/11 datasets comprised of 21 144 and 25 328 households, respectively, sampled from across the country (Stats SA, 2008, 2012). The study was limited to the data of the 2005/06 and 2010/11 surveys, as they are the most current data available from the Stats SA. Importantly, both surveys used the same classification of expenditure items, i.e. the COICOP[18], which will allow tax gap estimates for the two periods comparable[19].

The 2005/06 dataset disaggregates non-salaried income into self-employed income, business income, income from subsistence farming, income from letting of fixed property, royalties, interest received and/or accrued, dividends, fringe benefits, pensions, emoluments, in-kind income and grants. Such a disaggregation allows the estimation of the tax gap by source. In contrast, the 2010/11 dataset broadly classified households' income into salaried and non-salaried income. The salaried income component included salaried income for employers and own-account workers who report incomes through self-assessment. It is therefore imperative to disentangle the self-reported income from the salaried income. Notably, the Stats SA (2011) Quarterly Labour Force Survey (QLFS) established that employers and own-account workers constitute 10 percent of total employment (see also BER, 2016: 13). Hence, the 2010/11 self-reported income (employers' and own-account workers' income) is disentangled from third-party reported income by apportioning 90 percent of the total salaried income to PAYE. Further, both datasets record major tax exemptions, which include medical expenses and contributions to medical aid, pensions, provident and annuity funds. This makes it possible to account for the major tax exclusions and expenditures in the calculation of the tax gaps.

The data also captured the ages of the respondents, which allowed the estimation model to incorporate the progressive nature of the tax rate structures, a critical aspect in estimating individual tax liabilities. The income tax liability is derived from all taxable income that includes, but is not limited to, remuneration income, business income, fringe benefits, taxable capital gains, interest and rental income (Black, Calitz & Steenekamp, 2015; SARS, 2016). More specifically, in determining the tax amount due, exclusions (for example in-kind income, unrealised capital gains and imputed rent) are removed from the total (comprehensive) income to arrive at gross income. Items that are exempt from income tax are then excluded from the gross income. Exempt income includes a tax-free portion of interest and some pension income (for example a war veteran's pension and disability pension).

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[18] The Classification of Individual Consumption by Purpose (COICOP) is a modern technique used to classify individual income and expenditure (see Stats SA, 2012).
[19] The data used was 'cleaned' and validated by the Department of Economics (University of Stellenbosch).

After exemptions are deducted from the gross income, allowable tax deductions (such as pension contributions, medical contributions, depreciation allowances and donations to an approved public benefit organisation) are excluded from the income balance to produce the taxable income (Black *et al.*, 2015: 256).

It is on the taxable income that the applicable statutory tax rates are applied to determine the tax amount. The tax amount is further reduced by a rebate that is linked to a taxpayer's age. The rebates determine the tax threshold for different age groups. Thus, in cases where the tax amount is less than the rebate, such a discrepancy does not result in a credit or a refund (SARS, 2016: 9). Table 3.1 summarises how the tax amount payable is calculated.

Table 3.1: Calculation of personal income tax liability

	Amount (R)[20]
Total (comprehensive) income	1080
Less: Exclusions	10
Gross (cash) income	1070
Less: Exemptions	40
Deductions	30
Taxable income	1000
Multiply by tax rate	10%
Tax amount	100
Less: Rebate	20
Tax payable	**80**

Source: Author's own calculations.

This study employed a micro-simulation model in line with Ahmed & Rider (2013) to estimate the PIT gap. Importantly, the model for this study was constructed in line with the tax requirements of the South African PIT system. The micro-simulation model was therefore constructed in STATA, in line with the above-illustrated tax calculation (Table 3.1). Using a tax calculator, a line by line estimation of tax liabilities is performed on all positive taxable incomes. The estimated tax amounts are then grossed up to national levels using household weights. The weight is an inverse of the household's probability of selection. These weights are meant to gross the sample to the national population. Grossed up tax liabilities are added together to produce the total amount of tax revenue which the state should collect if every taxpayer complied with the tax legislation.

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[20] The figures used are arbitrary amounts for illustrative purposes.

In this study, the calculation of the PIT gap is carried out in three phases. Firstly, the tax calculator is applied to gross income (income inclusive of tax expenditures). This gives the amount of tax revenue the state would collect in the absence of tax expenditures, such as rebates or deductions for medical expenses. Secondly, the potential tax liability is calculated from the total taxable income. The discrepancy between these two theoretical tax liabilities (i.e. from the gross income and the total taxable income) gives an estimate of the policy gap. Furthermore, the theoretical tax liability derived from the total taxable income is compared to the personal income tax collections (obtained from SARS). The difference between these two figures is the compliance gap.

The third step entails applying the tax calculator to salaried income to estimate its respective theoretical tax liability. The estimated potential tax liability is then matched against the actual PAYE collections[21]. The difference is the salaried income tax gap (Ahmed & Rider, 2013: 340). The theoretical tax liability for the provisional taxpayers (non-salaried taxpayers) is established by subtracting the salaried tax liability from the total theoretical liability. The estimated potential tax liability for the provisional taxpayers is then compared with the actual tax collections from provisional taxpayers, and the discrepancy between these two figures is the tax gap in respect of non-salaried income earners.

In both years, major exemptions and deductions included war veteran's and disability pensions, medical expenses and medical aid contributions, donations to Public Benefit Organisations, pension fund contributions, retirement annuity fund contributions, legal fees, doubtful debts and wear and tear (SARS, 2010: 220-221). Deductions in respect of pensions and retirement contributions were limited to 7.5 and 15 percent of the taxable income, respectively. However, in both datasets, pensions and retirement annuity fund contributions were combined with provident fund contributions. Provident fund contributions are, however, not deductible: in order to separate provident fund contributions, the study has assumed that one-third of the combined funds constitutes contributions to the provident fund. The tax calculators for the micro-simulation models were constructed based on tax guidelines for the 2005/06 and 2010/11 tax years.

Personal income tax brackets for 2005/06 and 2010/11 tax years are shown in Table 3.2:

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[21] Actual collections in a year include late payments, which may underestimate the tax gap.

Table 3.2: 2005/06 and 2010/11 Personal Income Tax brackets

Tax year	2005/06	2010/11	Marginal PIT rates
Taxable income brackets (Rands)	0 – 80 000 80 001 – 130 000 130 001 – 180 000 180 001 – 230 000 230 001 – 300 000 300 001 and above	0 – 132 000 132 001 – 210 000 210 001 – 290 000 290 001 – 410 000 410 001 – 525 000 525 001 and above	18% 25% 30% 35% 38% 40%
Rebates: Primary Secondary Tax thresholds: Below age 65 Age 65 and above	 6 300 4 500 35 000 60 000	 9 756 5 400 54 200 84 200	

Source: SARS, 2006 and National Treasury and SARS, 2011.

In calculating the taxable income, it is worth mentioning that both the 2005/06 and 2010/11 datasets do not reveal how medical expenses were settled. Thus, it is not explicit whether the payment was done by the employer, household member or through a medical aid. The data do however, reveal that approximately 25 percent of household income is devoted to medical aid contributions. It was therefore assumed that 75 percent of the medical expenses were met by medical aid insurers. Medical expenses and medical aid contributions' deductions were each limited to R500 and R625 per month in 2005/06 and 2010/11, respectively. In the event that the medical aid contributions made by the employer exceeded the afore-mentioned thresholds, the excess amount was taxed as a fringe benefit. This excess amount is presumed to be a medical expense paid by the employer and, as such, it is deducted from the medical aid contributions made by the employee (SARS, 2010: 221).

In sum, the micro-simulation model constitutes three broad steps to calculate the potential tax liability. First, it calculates the taxable income (*taxY*) for every household (*i*), defined as the difference between gross income (Y_i) and deductions (*deduc*$_i$):

$$\begin{cases} taxY_i = Y_i - deduc_i \\ \quad \forall \, taxY_i > 0 \end{cases} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (1)$$

Second, the tax liability (X_i) is calculated by applying the tax rates and rebates to taxable income for the year of assessment:

$$X_i = f(taxY_i : Tax\ structure) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (2)$$

Third, the tax liabilities are grossed up to national levels using household weights (ω_i). The grossed up tax liabilities are added together to produce the theoretical tax liability:

$$Theoretical\ tax\ liability = \sum_{1}^{N} \omega_i X_i \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3)$$

To establish the compliance gap, actual collections (Z_0) are subtracted from the theoretical tax liability:

$$Compliance\ gap = \sum_{1}^{N} \omega_i X_i - Z_0 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots..\dots\dots\dots\dots\dots\dots\dots\dots..(4)$$

To establish the amount of tax the government would collect in the absence of tax expenditures, the tax liability for each household is calculated by applying the tax rates to the gross income for the year of assessment:

$$G_i = f(Y_i: Tax\ structure) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots..\dots\dots.(5)$$

The tax liabilities are grossed up to national levels using household weights (ω_i), and added together to produce the gross theoretical tax liability:

$$Gross\ theoretical\ tax\ liability = \sum_{1}^{N} \omega_i G_i \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots..\dots\dots\dots\dots\dots\dots\dots\dots\dots(6)$$

The discrepancy between the theoretical tax liability (from taxable income) and gross theoretical tax liability provides the policy gap:

$$Policy\ gap = \sum_{1}^{N} \omega_i G_i - \sum_{1}^{N} \omega_i X_i \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots..\dots\dots\dots\dots\dots\dots..\dots\dots\dots\dots\dots\dots\dots..(7)$$

3.6.2   Findings and discussion

This study estimated the PIT gap for the 2005/06 and 2010/11 tax years. The tax gap was disaggregated by its nature (policy and compliance) and by the source of income (salaried and non-salaried). For comparability, the tax gap estimates were inflated to the 2017 prices.

Policy gap

In the absence of tax expenditures, the government could collect potential tax revenue of R382.3 billion from individual taxpayers in 2005/06, and R449.6 billion in 2010/11. The granting of tax expenditures reduced it to R276.4 billion and R316.6 billion, respectively. This implied that the policy gaps (the amount of revenue forgone due to the impact of policy) for the 2005/06 and 2010/11 tax years were R105.9 billion and R133 billion, respectively. In both years, approximately 30 percent of personal income tax revenue remained uncollected due to tax expenditures. These are definitely very large policy gaps. In other words, the government has been losing significant amounts of revenue in its effort to reduce taxpayers' burdens. The tax gap estimates are summarised in Table 3.3.

Table 3.3: Summary of policy gap estimates

Tax Year	2005/06	2010/11	2005/06	2010/11
	Nominal values		Real values (2017=100)	
Potential tax liability from gross income	R189.6 billion	R302.0 billion	R382.3 billion	R449.6 billion
Potential tax liability from taxable income	R137.1 billion	R212.7 billion	R276.4 billion	R316.6 billion
Policy gap	**R52.5 billion**	**R89.3 billion**	**R105.9 billion**	**R133.0 billion**
Policy gap to gross income potential liability	27.7%	29.6%	27.7%	29.6%

Source: Author's own calculations.

Compliance gap

The years 2005/06 - 2010/11 is the period during which the government initiated several administrative (and enforcement) measures, which include the introduction of the modernisation programme, the administrative penalty regime, tax awareness campaigns and the compulsory taxpayer registration programme (the ITPR), among others (see Section 2.4). The tax gap estimates are summarised in Table 3.4.

In 2005/06 the authority had the potential of collecting R276.4 billion worth of PIT revenue. However, only R216.3 billion was collected, producing a compliance gap of R60.1 billion. This implied a compliance rate of 78.3 percent. The tax revenue forgone (due to non-compliance) is equivalent to 21.7 percent of the potential tax revenue. Relatedly, if every individual taxpayer complied with the tax requirements in 2010/11, the government should have collected R316.6 billion. However, only R290.4 billion worth of PIT revenue was collected, producing a compliance gap of R26.2 billion and a compliance rate of 91.7 percent. In other words, the government was prejudiced of 8.3 percent of the potential tax revenue. Although this is a commendable improvement from the 2005/06 tax year, the extent of evasion is still significant.

In 2005/06, of the R276.4 billion potential PIT revenue, R218.2 billion should have been raised from employed individuals' taxes (i.e. PAYE). However, PAYE collections amounted to R201 billion, implying a PAYE tax gap of R25.6 billion and a compliance rate of 92.1 percent. In 2010/11, instead of raising R265.1 billion worth of PAYE, the government managed to collect R264.8 billion and was prejudiced by R0.3 billion through non-compliance (a 99.9 percent compliance rate).

The potential tax liability (from taxable income) for provisional taxpayers was found to be R58.2 billion for the 2005/06 tax year. Thus, if all provisional taxpayers honoured their tax obligations in 2005/06, their tax contributions would amount to R58.2 billion. However, their actual payments totalled R15.3 billion. Thus, the government lost a total of R42.9 billion worth of revenue through non-salaried taxpayers' non-compliance. The compliance rate was 26.3 percent. In 2010/11, instead of collecting R51.5 billion from this same group of taxpayers, only R25.6 billion was collected, thus

implying a tax gap of R25.9 billion and a compliance rate of 49.7 percent. Although this is an improvement compared to the 2005/06 tax year, it is worth noting that over 50 percent of the non-salaried potential tax revenue remained uncollected in 2010/11.

Table 3.4: Summary of compliance gap estimates

Tax Year	2005/06	2010/11	2005/06	2010/11
	Nominal values		Real values (2017=100)	
Potential tax liability from taxable income	R137.1 billion	R212.7 billion	R276.4 billion	R316.6 billion
Actual PIT collections	R107.3 billion	R195.1 billion	R216.3 billion	R290.4 billion
PIT compliance gap	**R29.8 billion**	**R17.6 billion**	**R60.1 billion**	**R26.2 billion**
PIT gap to potential tax liability (taxable income)	**21.7%**	**8.3%**	**21.7%**	**8.3%**
Compliance rate	**78.3%**	**91.7%**	**78.3%**	**91.7%**
PIT gap to total collections ratio	**27.8%**	**9.0%**	**27.8%**	**9.0%**
Potential tax liability (salaried income or PAYE)	R108.2 billion	R178.1 billion	R218.2 billion	R265.1 billion
Actual PAYE collections	R99.7 billion	R177.9 billion	R201.0 billion	R264.8 billion
PAYE Tax gap	**R8.5 billion**	**R0.2 billion**	**R17.2 billion**	**R0.3 billion**
Salaried taxpayers' compliance rate	**92.1%**	**99.9%**	**92.1%**	**99.9%**
PAYE tax gap to total PIT gap ratio	28.5%	1.1%	28.5%	1.1%
Potential tax liability (non-salaried)	R28.9 billion	R34.6 billion	R58.2 billion	R51.5 billion
Actual collections (non-salaried)	R7.6 billion	R17.2 billion	R15.3 billion	R25.6 billion
Non-salaried income tax gap	**R21.3 billion**	**R17.4 billion**	**R42.9 billion**	**R25.9 billion**
Non-salaried taxpayers' compliance rate	**26.3%**	**49.7%**	**26.3%**	**49.7%**
Non-salaried tax gap to total PIT gap ratio	71.5%	98.9%	71.5%	98.9%

Source: Author's own calculations.

In terms of the composition of the total PIT gap, salaried employees contributed 28.5 percent in 2005/06, a figure that declined to 1.1 percent in 2010/11. Conversely, 71.5 percent of the 2005/06 total PIT gap came from non-salaried individual taxpayers. In 2010/11, and despite a significant improvement in their compliance rate (from 26.3 to 49.7 percent), non-salaried taxpayers' share of the total tax gap increased to 98.9 percent. Hence, the study did not reject the hypothesis that self-reporting taxpayers mainly constituted South Africa's PIT gap.

The overall improvement in PIT compliance might be attributed to government-induced tax reforms, particularly modernisation initiatives (for example e-Filing and BQMS) (see Section 2.4.2). These

reforms made it relatively less costly to comply, hence motivating taxpayers to oblige with the requirements of the tax legislation. In an endeavour to broaden the tax base, the government rolled out an Individual Taxpayer Policy Registration programme, requiring all formal employees to be registered as taxpayers regardless of their tax liabilities. The programme led to an increase in the number of individual registrants, from 5.9 million in 2009 to 10.3 million in 2010/11, which is more than double the 2005/06 total number of taxpayers. This compulsory registration of employees could be the main explanatory factor behind the tremendous increase in salaried taxpayers' compliance rates.

The improvement in the compliance rate can also be attributed to other factors, apart from the government-induced tax reforms discussed above. For instance, the usage of cash in transacting has been declining over the years, as the use of credit cards, debit cards and smartphones expanded. This made it relatively difficult to evade taxes, as electronic payments leave a trail of trade (Alm & Soled, 2016: 3). Businesses have been expanding too. The expansion of informal businesses transforms them into formal businesses, making it relatively difficult for employers and employees to collude to evade taxes (Alm & Soled, 2016: 22). The decline of the gap's size, particularly the non-salaried taxpayers' gap, can be attributed to the upsurge of non-cash transactions (together with the expansion of businesses).

A higher non-compliance rate by non-salaried income earners in both years (2005/06 and 2010/11) seems to suggest that a significant number of provisional taxpayers are outside the tax net, a concern raised by the Davis Tax Committee in its Third Interim Report. The low compliance rate by the non-salaried taxpayers seems also to confirm that self-reporting is more prone to abuse than third party reporting. As pointed out by Paulus (2015), self-assessment provides taxpayers with relatively more opportunities to misreport income, compared to third party reporting. Paulus (2015: 9) further highlighted that, because there were few incentives for employers to misreport employees' income, it would take employees to collude with the employers in order to evade. Depending on the availability of such opportunities, it was more difficult to evade salaried income tax than non-salaried income tax (Paulus, 2015: 24). Ahmed & Rider (2013: 343) also argued that a withholding tax regime is an effective revenue mobilisation technique. The results from this study seem plausible considering that the HMRC (2018) also established that self-assessment taxpayers constituted the largest share of the UK's tax gap (see Section 3.3).

3.7   CONCLUSION

This study provides some fundamental insights into the performance of South Africa's PIT system. It has been established that a significant amount (one-third) of the country's PIT revenue is lost through policy-related effects (tax expenditures). Although tax expenditures play an important role in reducing tax burdens, there is a need to examine the possibility of reducing the policy gap. Its reduction may raise a significant amount of revenue.

A 99.9 percent compliance rate by salaried individual taxpayers is evidence that withholding of taxes is a more effective way of minimising non-compliance. Conversely, there are serious tax leakages in the enforcement of self-assessment. However, improvements in compliance suggests that tax reforms can significantly improve the performance of the tax system. There is, therefore, need to further counter non-compliance, particularly from self-reporters. Compliance enhancement measures may include formalising the underground economy and carrying out some taxpayer educational campaigns.

It would be more informative to establish the country's tax gap using more recent individual-level data (as opposed to using household-level data). This is because household-level data may push incomes to higher tax brackets, causing an overestimation of theoretical tax liabilities and, ultimately, the tax gaps. However, due to data constraints, the study uses household-level data and is limited to 2005/06 and 2010/11. It would also be more enlightening if the tax gaps were estimated following the HMRC approach. However, such an approach requires access to audited data that is produced and made available by the tax authority. Due to confidentiality of taxpayers' information, tax audit data is not easily accessible for the purposes of academic research, particularly in South Africa.

Notwithstanding the afore-mentioned limitations, results from this study revealed that South Africa has a relatively high performing PIT system, when compared to Pakistan (see Ahmed & Rider, 2013). However, it is lower than of developed countries such as Sweden and the UK, whose personal income tax compliance rates are at 95 percent. It would be more insightful to compare South Africa's PIT gap with other developing countries'. However, apart from Pakistan, there seems to be no other study on PIT on developing countries.

Notably, the government has been instituting a number of measures to its tax system to improve compliance. These measures include introducing new penalty structures (and strengthening others) and also providing taxpayers with some reprieves (amnesties and VDPs). However, the effect of these measures on compliance remains an unresolved question.

This study employs experimental methods to examine taxpayers' behavioural responses to audits, penalties and VDPs. In light of this, the next chapter provides an overview of experimental methods, which is the methodological approach employed to examine taxpayers' behaviour in subsequent chapters.

CHAPTER 4

EXPERIMENTAL METHODS - AN OVERVIEW

4.1   INTRODUCTION

The standard neoclassical economic model of human behaviour regards taxpayers as selfish utility maximisers, whose decisions to pay or evade taxes are solely influenced by economic considerations (Sandmo, 2005; Alm, Martinez-Vasquez & Torgler, 2010). Accordingly, it is suggested that deterrent measures such as audits and penalties play a pivotal role in dissuading taxpayers from evading. Furthermore, there is a growing number of writings that ague that individual decisions may also be influenced by non-economic factors. Such factors include notions of fairness, altruism, guilt, shame, morality, and many others (see Cummings, Martinez-Vazquez, McKee & Torgler, 2009; Torgler, Schaffner & Macintyre, 2009; Alm, 2010; Alm & Torgler, 2011). As such, it is argued that tax compliance can be enhanced by employing measures that appeal to taxpayers' moral sentiments (Erard & Feinstein, 1994: 75). Importantly, the incorporation of non-economic factors in the study of human behaviour constitutes 'behavioural economics', which is loosely defined as the application of methods or evidence from other social science disciplines (like sociology and psychology) to understand individual and group decision making (Alm & Sheffrin, 2016: 130).

Alm (2010) affirmed that individuals' choices to pay or evade are driven by many complex factors that are difficult to observe in a naturally occurring world, making it difficult to assemble complete and reliable behavioural data. In addition, there are circumstances where it is even impossible to assemble data from a naturally occurring world because of the absence of a relevant real world set-up (Alm & Jacobson, 2007: 130). Apart from this, tax evasion is by nature an illegal behaviour and, as such, offenders tend to conceal their misdemeanours to avoid the consequential results associated with non-compliance (if detected), making it difficult to observe evasion in a naturally occurring world. As a result, empirical studies on behavioural responses to policy changes have often been plagued by data scarcity, incompleteness and unreliability (Alm, 2012: 56). With the absence of adequate and reliable data on non-compliance, it is difficult to predict taxpayers' behaviour and to come up with sound policies. To circumvent this challenge, economists are increasingly resorting to experimental methods, whereby factors suggested by theory are tested individually and independently in a simplified controlled environment, created to reflect a real economic system (Alm & Torgler, 2011: 641). This, then, provides the investigator with a better opportunity to generate reliable data on compliance behaviour.

In light of the foregoing discussion, this chapter seeks to provide an overview of experimental methods, which are the methodological approaches employed in the subsequent chapters (i.e. Chapters 5 and 6). This chapter is structured as follows: Section 4.2 provides an overview of the different types of experiments. Section 4.3 discusses the importance and relevance of experimental

methods in examining economic behaviour. Section 4.4 discusses limitations of the experimental methods. Section 4.5 discusses the conditions to be satisfied when designing an experiment. This section also discusses different designs for experimental methods. Section 4.6 provides an overview of how experiments have been applied to examine compliance behaviour.

4.2   TAXONOMY OF EXPERIMENTS

There are four types of experiments: conventional laboratory, artefactual field, framed field and natural field experiments (Harrison & List, 2004: 1013–1014). Conventional laboratory experiments involve the creation of a controlled environment where a set of conditions (or rules) are imposed to mimic the real world environment. The importance of such a setting is to provide the investigator with "control over the environment, institutions, incentives and preferences subjects face" (Alm, 2010: 639). In this set-up, the investigator is able to vary these institutions and incentives (in isolation of each other) in order to observe the responses to changes in these factors. Controlled laboratory environments further allow replication of the same experimental set-up in order to test the robustness of the findings (Alm, 2010: 641). Importantly, in a conventional laboratory experiment, students are the standard subject pool and are used as subjects for a number of reasons. Firstly, most experiments are undertaken within universities. Student subjects therefore become a natural subject pool, as they are easily accessible. Secondly, students are quick learners: they are not exposed to external confounding information. Lastly, students' preferences are relatively less costly to control: small amounts of money, for example, can be salient and dominant (see Section 4.5.1).

Closely related to a conventional laboratory experiment is an artefactual field experiment. The distinction between the two is that an artefactual field experiment draws its subjects from a non-student subject pool (Friedman & Sunder, 1994; Harrison & List, 2004). In the same way, a framed-field experiment is linked to an artefactual field experiment. A framed-field experiment, however, employs real physical commodities (e.g. chocolates, sweets, clothes, etc.) to reduce the artificiality of the experimental environment. It should, however, be noted that the use of real commodities may produce unrepresentative behaviour. This is because people have asymmetric information about the value or quality of a commodity and this definitely affects their choice (behaviour) beyond the experimenter's expectation. In addition, when people are asked to rate a commodity, they generally put more value on a good they own (or they previously owned) than on a commodity they never owned (see Harrison & List, 2004: 1024). Harrison & List (2004) further highlighted that the other challenge with the use of real commodities was that they had substitutes. Depending on the level of substitutability, subjects may substitute one commodity with another. Indeed, people generally prefer commodities that suit their interests. It is therefore difficult to induce some pre-specified characteristics into subjects using physical commodities. Thus, framed-field experiments may reduce the investigator's control over the experimental exercise, which may lead to spurious responses.

The last type of experiment is the natural field experiment. This experiment is akin to the framed field experiment, though they differ in that natural field experiments are carried out in a natural environment and subjects are drawn therefrom. Under this setting, subjects participate without knowing that they are in an experiment. Because these experiments take place in a natural environment, their results are regarded as bearing higher external validity than those obtained from other experiments (Harrison & List, 2004; Hallsworth, Metcalfe, List & Vlaev, 2014; Weber, Fooken & Herrmann, 2014). Natural field experiments are, however, costly, and it is difficult to observe behavioural changes in the field. In certain circumstances, natural field experiments are impractical. In fact, field experiments suffer from the same constraints faced by observational studies (Harrison & List, 2004; Weber *et al.*, 2014; Alm, Bloomquist & McKee, 2015).

In light of the foregoing discussion, it is evident that conventional laboratory experiments can be a useful approach to examine human behavioural responses to policy changes. Most importantly, unlike other experiments, controlled laboratory experiments provide the investigator with control over the environment, institutions, incentives and preferences subjects face. Controlled laboratory experiments also allow replication of the same experimental set-up in order to test the robustness of the findings.

4.3   ADVANTAGES OF EXPERIMENTAL METHODS

Given the complexities of forces that operate in the natural world, there is substantial difficulty in "empirically testing the predictive power of economic theories using happenstance data" (Alm *et al.*, 2015: 1171). Alm (2010: 640) affirmed that, due to the complexities of factors in the natural world, it is difficult for an investigator to be certain that the many variables that may drive individual behaviour are held constant (while focusing on the variables of interest). More specifically, variables that are thought to affect behaviour may conflict with many other variables, thereby making it difficult to separate effects of nuisance variables from variables of interest. In contrast, in an ideal experimental setting, only one variable is varied at a time: the rest are held constant. This allows the investigator to disentangle the effects of the variable of interest from everything else.

Weber *et al.* (2014: 16) highlighted that economic experiments had comparative advantages over other research models. They argued that models cannot adequately cater for all factors that influence human behaviour, without being too complex. Experimental methods are, however, not affected by the same degree of simplification required in both theoretical and empirical models (Alm, 2010: 640–641), making it possible to examine the validity of many generalised behavioural notions. For instance, neo-classical economics assumes that people are always egoistic utility maximisers who would evade whenever the benefit of evasion outweighs the benefit of paying taxes (Allingham & Sandmo, 1972; Sandmo, 2005). This has led authorities to use deterrence measures such as audits and penalties to influence taxpayers to comply. However, it is difficult to observe the effect of these measures on compliance behaviour in a naturally occurring world (or using administrative data).

Experimental methods can therefore be employed to investigate the impact of deterrence measures on compliance behaviour in a simplified, controlled environment (Alm, Jackson & McKee, 2004; Alm & Sheffrin, 2016).

Contrary to the neo-classical assumption that people are always egoistic utility maximisers, several other factors are said to influence compliance behaviour. These include social norms, altruism and fairness, amongst others (Alm & Martinez-Vazquez, 2001; Onu & Oats, 2014; Weber, Fooken & Herrmann, 2014). These factors are difficult to observe or control in a naturally occurring world; they are, however, more amenable to experimental testing. Reeson & Karel (2009: 2) affirmed that experimentation can explicitly reveal the trade-off between personal and collective interests, clearly portraying how individuals cooperate and compete. Thus, experiments provide an opportunity to observe causal effects that are unobservable in a naturally occurring world.

Reeson & Karel (2009: 1–2) also highlighted that economic theories were not developed in such a way that adequately captured every policy scenario. Accordingly, the application of these theories could be affected by the unavailability of information. To avoid unexpected policy outcomes, it is suggested that policy and incentive mechanisms should be experimentally tested in a simplified laboratory environment before their actual implementation (Holt, 2007; Reeson & Karel, 2009; Alm, 2010). If those policy prototypes produced unintended results in an experimental environment, then it was highly unlikely that they would be effective in the real world. Experiments, therefore, provide grounds for testing policies, empirically, before their actual implementation. Friedman & Sunder (1994) and Holt (2007) pointed out that experimental methods also allow for direct comparison of alternative policies under controlled environments, thereby providing a practical basis for policy choices.

Reeson & Karel (2009) and Alm (2010) argued that experiments allow for the generation of more reliable data in a setting where the experimenter has control over institutions and incentives that influence subjects' decisions. In an experimental setting, the investigator has the flexibility to vary the variables and observe their effects on the subject of interest, while allowing for replication of the exercise for robustness checks. With these qualities, experimental approaches provide researchers with the ability to derive unambiguous casual inferences between variables.

4.4   LIMITATIONS OF EXPERIMENTAL METHODS

Despite their wide acceptance, there are concerns over the reliability of results from experimental methods, more particularly controlled laboratory experiments. There are two (but related) main concerns over experimental methods. The first pertains to the use of student subjects to represent the 'real' subjects (Weber *et al.*, 2014: 4). It is argued that students may not adequately represent real taxpayers in tax compliance experiments, due to the differences in socio-demographic characteristics and economic backgrounds between students and real taxpayers. The second

concern regards the conceptual abstraction surrounding the task (treatment) (Choo, Myles & Fonseca, 2014: 4). It is argued that there is typically little context (or realism) surrounding the decisions subjects must take. In other words, there are fears of possible obstruction of subjects' choices, due to the failure of experimental environment to mimic the natural world setting. Thus, these concerns cast some doubts on the external validity of laboratory experiments, which is the applicability of experimental results to a real world situation.

Despite the concerns discussed above, there is now vast evidence (e.g. Plott, 1987; Alm & Jacobson, 2007; Alm, Martinez-Vasquez & Torgler, 2010; Alm, Bloomquist & McKee, 2013; Alm *et al.*, 2015) that show no significant differences in behavioural responses between students and non-student subjects. For instance, Alm *et al.* (2015) undertook a two-pronged approach to examine the external validity of laboratory experiments. Firstly, they contrasted results from laboratory experiments against those from non-experiments. More specifically, they compared students' tax reporting compliance decisions against similar decisions by real taxpayers, who faced some random audits, in the US. This comparison was meant to examine if context (context effects) affected the external validity of laboratory experiments. Results from this examination showed that students and real taxpayers exhibited similar tax reporting patterns. Alm *et al.* (2015: 1177) asserted that laboratory experiments could reliably portray behaviour in the naturally occurring world.

In the second stage of the analysis, Alm *et al.* (2015) sought to address the aspect of subject pool effects (difference in behavioural responses between students and non-students). They compared behavioural responses by students and non-students, derived from identical laboratory settings. The study established that students' responses were largely similar to those of real taxpayers, especially in response to policy variables (Alm *et al.*, 2015: 1182). Alm *et al.* (2015: 1183) concluded by asserting that concerns over the external validity of experimental results, particularly on tax compliance and behavioural changes, seemed to be unwarranted. Alm & Jacobson (2007: 143) concurred with Alm *et al.* (2015), arguing that there was virtually no justification to assume that students and non-students had different cognitive responses.

Bloomquist (2009) compared the compliance behaviour of students in a controlled laboratory experiments to that of real taxpayers subjected to random audits in the field and found similar behavioural responses across the two population samples. This implied that students and non-students subjects had the same cognitive behavioural responses, which further confirmed the external validity of controlled laboratory experiments.

Friedman & Sunder (1994), Holt (2007) and Falk & Heckman (2009) also argued that the external validity of laboratory experiments were not affected by the subject pool. They emphasised the role played by financial incentives in an experiment, arguing that regardless of the subject pool (student or non-student) subjects would produce similar behavioural responses if financial incentives were dominant enough.

Alm & Torgler (2011: 642) highlighted that controlled experiments provided the investigator with control over the environment covered by the study. It was therefore argued that, if there were factors that couldn't be controlled for in a laboratory where the investigator "establishes the institutions, the rules and the reward structure", then it would be even more difficult (if not impossible) to control these factors outside of a laboratory environment. Alm & Torgler (2011) therefore argued that there was no reason for controlled experiments to bear a lower validity than field experiments.

4.5 GENERAL EXPERIMENTAL DESIGN

The fundamental component of an experiment is control. An experimental setting should be as simple as possible and, at the same time, capture the key aspects of a naturally occurring world. The experimental environment need not attempt to capture all aspects of the real world; instead, it should capture fundamental elements of the real world that are sufficient to address the research problem (Alm, Deskins & McKee, 2009; Reeson & Karel, 2009). This simplification is necessary to crowd out complexities of the naturally occurring world, thereby providing the investigator with some control over the study. As highlighted in Section 4.2, for clear causal inferences, only one parameter should be varied while all others are held constant. This enables the experimenter to separate causal effects among variables. Furthermore, the experimental environment has to be created in a way that reduces the effect of nuisance factors. In this regard, most experiments are computerised. Computers provide the experimenter with a greater degree of control and flexibility, as the same experimental instructions can be simulated in different sessions (Reeson & Karel, 2009: 3).

There are circumstances in which results from an experiment are impaired by human factors. For instance, a subject's behaviour in an experiment could be influenced by their exposure in the previous experiment(s). To crowd out the confounding effects of experimental experience, it is advisable that each experiment (or session) be undertaken with subjects who do not have prior exposure to the same (or similar) experimental setting. In addition, subjects' preferences can be controlled by inducing some value in the laboratory environment, an approach referred to as the induced values method (or theory). The induced value theory requires that participants' payoff be matched to decisions (actions) taken in an experiment. In other words, subjects' actions should bear some real value.

4.5.1 The induced value theory

The induced value theory is based on four precepts: monotonicity, salience, dominance and privacy. The condition of monotonicity requires that the experimenter uses a reward medium that subjects prefer more of than less (Friedman & Sunder, 1994; Harrison & List, 2004). It further stipulates that an experimental environment should be crafted in a way that makes it costly to shift from one choice to another, lest the decision-making be influenced by subjective costs. In this regard, most

experiments use currency as the reward medium because it satisfies the monotonicity precept more than any other reward medium (Harrison & List, 2004; Holt, 2007).

The salience condition requires that the experiment be designed in such a way that subjects' payoffs be dependent on their decisions in the experiment, based on their understanding of the institutional rules that govern the experiment. In other words, the outcome under investigation should be effected by the interaction between one's actions and his expected payoff. Illustratively, a fixed reward for merely attending an experimental session does not satisfy the salient condition because it is not dependent on one's action during the experiment. The salient condition is therefore satisfied when subjects' rewards are directly related to their choices in the experimental exercise.

The dominance precept stipulates that the reward medium should be able to dominantly influence subjects' choices and subdue other influences. In some instances, dominance is hindered by other unobservable influences such as idiosyncrasies (personal differences e.g. preferences). In order to counter or minimise the effects of such individual decision-making costs, it is recommended that the experimenter increase the salient payoffs. However, it is possible that an individual may not be an autonomous own-reward utility maximiser and that his actions depend on the course of action taken by others. Under such circumstances, subjects' induced-value characteristics would be distorted if counter measures were not taken. In order to avoid interpersonal characteristics from distorting the results of an experiment, it is necessary to ensure that individuals' payoffs are kept private during the exercise.

In summary, the induced value theory prescribes that an experimenter should explicitly link subjects' actions to their payoffs (salience), introduce a motivating reward medium (monotonicity) and crowd out other stimuli (dominance and privacy). Ideally, the induced-value theory requires that every decision taken by participants should have some financial implication; otherwise, results from the experiment may lead to invalid causal inferences due to the emergence of unrepresentative behaviour. Friedman & Shyam (1994: 18), however, highlighted that the induced-value method is not ironclad, arguing that an experimenter may (with good reason) deviate from the precepts but on condition that the implications thereof are well taken care of.

The central characteristic of experimental methods is that investigators can clearly observe behavioural responses in a theoretical environment they have control over. There are two basic approaches to construct these environments: between-subject and within-subject designs.

4.5.2   Between-subject and within-subject designs

Between-subject experimental designs vary the levels of the focus variable only across subjects. In so doing, subjects are only exposed to a single treatment. Causal effect inferences are obtained by comparing the behaviour of participants in one treatment group against those in other treatment groups. However, for reliable inferences, participants should be randomly assigned across treatment

groups (Charness, Gneezy & Kuhn, 2012: 1). On the other hand, within-subject experimental design uses different levels of the focus variable for each subject. In other words, each subject participates in more than one treatment. Causal inferences are obtained by observing each participant's behavioural responses to changes in treatments (Charness et al., 2012: 1).

There are advantages and disadvantages to each of these designs. A within-subject experimental design provides a host of benefits. Firstly, as participants are exposed to a multiple of treatments, the internal validity of within-subject does not depend on the randomisation of participants into treatment groups (Charness *et al.*, 2012: 2). Secondly, behavioural differences are controlled by allowing each participant be their own control; this is ideal in cases of high behavioural variability across individuals (Holt, 2007: 10). Furthermore, within-subject designs produces more observations, hence providing high statistical power. Finally, a within-subject design resonates well with most theoretical frameworks. Charness *et al.* (2012: 2) argued that a theorist would generally imagine an economic agent in a market responding to a policy change, rather than two agents in different markets responding to different policy changes. However, in situations where an individual is exposed to only one policy change, a between-subject experimental design becomes more relevant.

The main challenge with a within-subject design is that participants' responses can be influenced by both prior and subsequent treatments. As participants are exposed to multiple treatments, they may end up responding in a way they perceive to be the expectations of the experimenter. Thus, subjects may reflect distorted behaviour. These behavioural influences are referred to as order effects (Alm, Jackson & McKee, 1992; Friedman & Sunder, 1994; Harrison & List, 2004). These order effects are significant in a within-subject design and, as such, this design is susceptible to producing spurious results. In order to minimise order effects, one has to be mindful of the framing of treatments and the sequence of treatments. There is, in fact, a need to randomise the treatments.

Contrary to the within-subject design discussed above, a between-subject experimental design has no natural basis (Charness *et al.*, 2012: 2). Accordingly, results thereof usually have some noise and may lack essential and real configurations. The authors highlighted, however, that between-subject designs are normally associated with problems that focus on whether to make a decision or not. Similarly, problems that focused on which decision to make were normally examined using a within-subject design. Furthermore, Holt (2007: 10) highlighted that, if there was slow convergence in behaviour or if the study required many observations, it would be preferable to adopt the between-subject design. Holt (2007: 10) argued that a between-subject design generated repeated observations per treatment within the shortest time available.

Holt (2007: 10) highlighted that the between-design is ideal where there is less variability across individuals. Since each subject is exposed to only one treatment, the between-design is not affected by order effects that cause a change in behaviour, due to previous treatment(s). Furthermore, as

long as the subjects are randomly assigned across treatments, statistical analyses of between-design are relatively easy (Charness *et al.*, 2012: 2). They do, however, produce a low statistical power. This is because "each treatment group literally produces only one independent data point" (Charness *et al.*, 2012: 2).

In light of the foregoing discussion, it is evident that there is a trade-off between a within-subject and a between-subject design. However, these sometimes produce similar results (Holt, 2007; Charness *et al.*, 2012). Importantly, one has to be careful when choosing an experimental design and such a choice should be based on the context of the study to be undertaken. In some instances, it will be more beneficial to combine both designs (Holt, 2007: 11).

4.6   TAX COMPLIANCE BEHAVIOUR AND EXPERIMENTS

The use of experimental methods in examining compliance behaviour has expanded over the years. The design of the experiments has largely been dependent on whether they were undertaken in a laboratory (laboratory experiments) or in the field (field experiments).

4.6.1   The experimental framework

Since the seminal experimental study by Friedland, Maital & Rutenberg (1978), the general design of laboratory experiments on income tax compliance has been similar (Alm & Jacobson, 2007: 134). A controlled laboratory experiment is composed of treatment groups (sessions), which consist of rounds, where a round can be viewed to represent a tax year. Subjects are randomly assigned across the treatment groups. Most experiments on tax compliance are designed in such a way that the focus variable is varied across sessions and within rounds, which is a combination of the between- and within-subject experimental design (see Section 4.5.2).

To encapsulate elements of voluntary filing, participants are, at the start of the round, 'given' some income[22], which is expected to be reported for tax purposes. Importantly, the financial incentive (income) should be dominant enough to be able to influence the subjects' choices (i.e. satisfying the dominance precept) (see Section 4.5.1). The subjects are informed that they may keep their net incomes (after-tax incomes) at the end of the experimental exercise. In some instances, subjects' payoffs are drawn from one round chosen at random at the end of the experiment.

The reported income is taxed at a pre-announced tax rate. Although unreported income is not taxed, the taxpayer is subjected to some probability of audit. If a taxpayer is audited and an under-reporting is detected, the subject pays a penalty, which is typically calculated as a multiple of unpaid taxes. In order to observe taxpayers' choices, the process is repeated for a number of rounds. At the end of the experiment, participants are paid their accumulated earnings, the value of which depends on one's performance during the exercise. Thus, subjects' payoffs are not fixed, instead they depend

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[22] The income may be given as an endowment or 'earned' through a task.

on their actions, based on their understanding of the institutional rules that govern the experiment. Hence, satisfying the salience condition for an ideal experiment (see Section 4.5.1).

From this basic framework, policy variables can straightforwardly be introduced. These include audit rates, tax rates, social norms or any institutional changes that affect compliance (Alm & Jacobson, 2007: 134), depending on the objective of the study. In other words, the framework outline above is the standard design for controlled laboratory experiments for examining tax compliance behaviour. The framework will be modified by introducing other policy variables, in line with the objectives of the study in question.

Unlike laboratory experiments, field experiments do not have a general (or standardised) design. This is because fields are highly heterogeneous and, indeed, each field has its own peculiarities. These peculiarities imply differences in field experimental designs, thereby making it difficult to replicate experiments across fields (Harrison & List, 2004; Alm & Sheffrin, 2016). Field experiments are therefore not confined to one general framework.

4.6.2   Some experimental studies on tax compliance

The first tax compliance experimental study was conducted by Friedland *et al.* (1978). Using an admittedly small sample of 15 undergraduate students, the study sought to examine how tax evasion responded to changes in income, among other variables. It was established that an increase in income influenced taxpayers to evade. Since then, there has been a remarkable increase in the application of experimental methods in examining tax compliance.

Torgler (2012) used municipal level data from a field experiment to investigate the effect of moral persuasion on tax compliance in Switzerland. The data was extracted from a sample of 578 randomly selected taxpayers. The subjects were randomly classified into two groups: a treatment and a control group, and taxpayers in both groups received a tax form. Those in the treatment group received a letter from the tax authority, immediately after receiving a tax form. The letter spelt out taxpayers' moral requirements to pay taxes. Torgler (2012) found that moral persuasion had no significant effect on tax compliance. In a related study, Bó & Bó (2014) used a series of controlled laboratory experiments to explore the effect of moral persuasion on individuals' expectations and preferences. Contrary to Torgler (2012), Bó & Bó (2014) found moral persuasion to have a significant effect on both expectations and preferences.

In a related study, Torgler (2003) employed a controlled laboratory experiment with 37 non-student subjects (i.e. real taxpayers) to explore how tax compliance responded to positive rewards, fiscal exchange and moral persuasion, in Costa Rica. It was found that non-deterrence measures had no effect on taxpayers' compliance behaviour. There were, however, two fundamental limitations to this study. Firstly, the experiment was run for a small size of the sample group, thereby reducing the statistical power of the estimates. Furthermore, the small number of observations posed a challenge

when undertaking statistical robustness checks. Besides the small size of the population sample, the experiment was run for only one round. This suggested that compliance decisions were static. However, as taxes were paid regularly, decisions to pay (or evade) were influenced by past actions and, indeed, compliance decisions were dynamic. As such, these shortcomings could have affected findings from this study.

Hallsworth, Metcalfe, List & Vlaev (2014) explored the response of taxpayers with outstanding taxes when they are reminded of their debts with a letter that included information on social norms and public goods. The study was undertaken through conducting a two-year field experiment with a sample of over 100 000 self-reporting taxpayers in the United Kingdom. The study found that both descriptive and injunctive norms increased compliance. However, the former had a significantly larger effect than the later.

Cross-country tax compliance differences in southern Europe have often been attributed to different taxpayers' attitudes towards compliance. To test this assertion, Zhang *et al.* (2016) conducted laboratory experiments in the UK and Italy, whereby the influence of morality (or culture) on taxpayers' willingness to pay taxes was isolated from the experimental exercise. Although the treatment groups were conditioned to the same tax institutions and audit probabilities, subjects from Italy complied more than their British counterparts. It was evident from this study that the cross-country compliance differences in southern Europe were due to others factors besides poor taxpayer morality.

Alm, Bernasconi, Laury, Lee & Wallace (2016) examined the impact of confidentiality of taxpayers in two countries with different levels of citizen trust in government, the US and Italy. In both countries, payment of personal income tax relied on voluntary compliance and taxpayers were promised that information about their tax status would be kept confidential, at least until non-compliance was detected (Alm *et al.*, 2016: 4). Using identical laboratory experiments conducted in the US and Italy, Alm *et al.* (2016) examined the effect of "full disclosure" (e.g. release of photos of tax delinquents together with the extent of the evasion) and of "full confidentiality" (e.g. no public dissemination of photos and evasion). The results showed that compliance was greater, both in the US and in Italy, when tax delinquents were shamed (Alm et al., 2016: 23), implying that shaming tax evaders increased compliance.

Brockmann, Genschel & Seelkopf (2015) employed a controlled laboratory experiment to investigate whether rewarding honest taxpayers improved tax compliance. The experiment was composed of two treatment groups and a control group. Subjects in one of the treatment groups were subjected to a lucky reward through a chance to win a lottery, simulated to a VAT lottery. The other treatment group was subjected to a donation reward that granted compliant taxpayers an opportunity to determine how the government should expend tax collections. Treatment groups were matched against the 'deterrent' control group. The study found that rewarding incentives had an unambiguous

effect on compliance. With the introduction of the rewards, women significantly increased their compliance. In contrast, men's compliance severely plummeted. The study concluded that it was necessary to consider the implications of gender heterogeneity when instituting some tax policy changes.

Cummings, Martinez-Vazquez, McKee & Torgler (2009) used surveys and artefactual field experiments to examine the effects of taxpayers' morale on tax compliance in Botswana and South Africa. These experiments were run with staff and student subjects from these two countries. The study established that cultural differences had their origins in the institutions of the tax administration and citizens' perception on the quality of governance.

Over the past years, there have been a wide application of experimental methods to understand the effect of traditional enforcement measures (audits and penalties) on compliance. However, empirical evidence is mixed. Some (for example Slemrod, Blumenthal & Christian, 2001; Park & Hyun, 2003; Kleven, Knudsen, Kreiner, Pedersen & Saez, 2011) found that audits and penalties increased compliance. In contrast, others (Kirchler, Hoelzl & Wahl, 2008; Wahl, Kastlunger & Kirchler, 2010; Gangl, Torgler, Kirchler & Hofmann, 2014) found that deterrence measures reduced compliance (empirical studies on the effect of deterrence measures on compliance are discussed in detail in Chapter 5).

Experimental methods have also been used to investigate the impact of tax reprieves on compliance (see Alm, McKee & Beck, 1990; Alm & Martinez-Vazquez, 2001; Torgler, Schaltegger, Christoph & Svaffner, 2003). For instance, Torgler, Schaltegger, Christoph & Svaffner (2003) examined whether voter participation in the introduction of an amnesty would affect tax compliance. The researchers conducted laboratory experiments in Switzerland and Costa Rica, whereby subjects were given an opportunity to vote for or against the introduction of an amnesty. They discovered that an amnesty increased tax compliance when taxpayers were consulted on its introduction. The study also found that taxpayers' anticipation for an amnesty reduced compliance. These findings were echoed by Torgler & Schaltegger (2005), who found that giving taxpayers an opportunity to vote for an amnesty incentivised them to comply more. They concluded that allowing citizens to participle in policymaking induced in them some intrinsic will to abide with the requirements of the law (a detailed discussion on reprieves is covered in Chapter 6). In light of the foregoing discussion, it is evident that the application of experimental methods (particularly, conventional laboratory experiments) on tax compliance has significantly flourished, which seems to indicate the importance of experimental methods as a research methodology.

4.7   CONCLUSION

Empirical studies on tax behaviour have often been plagued by data scarcity, incompleteness and unreliability. This is largely due to two factors. Firstly, tax evasion is an illegal activity; as such, delinquents conceal their cheating to avoid being detected and punished, making it difficult to obtain reliable information on evasion. Secondly, individual choice to pay or evade is driven by many complex factors, which are difficult to observe in a naturally occurring world, making it challenging to assemble complete and reliable behavioural data. In some circumstances, it is impossible to assemble data from a naturally occurring world because of the absence of a relevant real-world set-up.

To circumvent challenges associated with happenstance data, researchers have turned to experimental methods, whereby economic behaviour is examined in a simplified, controlled environment, created to reflect a real economic system. Notably, there has been a significant increase in the application of controlled experiments relative to other types of experimental methods, over the past years. This could be because controlled laboratory experiments provide the investigator with more control over the environment, institutions, incentives and preferences subjects face. Controlled laboratory experiments also allow replication of the same experimental set-up in order to test the robustness of the findings. In addition, controlled laboratory experiments are the least expensive compared to other types of experiments.

Considering these advantages, this study employed controlled laboratory experiments to examine taxpayers' behavioural responses to audits, penalties and reprieves. Based on this discussion, Chapters 5 and 6 employed controlled laboratory experiments to investigate taxpayers' behavioural responses to audit and penalty rates, and tax reprieves, respectively.

CHAPTER 5

TAXPAYER BEHAVIOUR AND DETERRENCE MEASURES

5.1   INTRODUCTION

Tax revenue plays an integral role in the provision of goods and services. While taxes are essential to raise government revenue, they constitute a burden to taxpayers (Tanzi & Shome, 1993: 809). To reduce this burden, taxpayers may evade or avoid taxes, which limits the capacity of governments to fulfil their fiscal and economic obligations.

Governments use a number of instruments to dissuade taxpayers from evasion activities. These instruments are broadly categorised into deterrence and non-deterrence measures. The deterrence approach (commonly referred to as the traditional approach) requires the tax authority to detect evasion and severely punish those detected. The non-deterrence approach, however, uses persuasive means (reprieves and rewarding honest taxpayers, for example) to lure taxpayers into complying. In other words, the non-deterrence approach employs measures that appeal to taxpayers' moral sentiments (Erard & Feinstein, 1994: 75).

Deterrence measures include audits, financial penalties and incarceration. The intensiveness of these enforcement mechanisms varies across countries. Cummings et al. (2009: 449) pointed out that South Africa is one of the countries with a strict penalty regime, stricter than that of most African countries. Despite already having a generally harsher penalty structure, the government further introduced - in 2009 - an administrative penalty regime (SARS, 2016a: 406). The introduction of the administrative penalty regime was in response to an increase in the number of taxpayers who failed to meet submission deadlines. For instance, over a million tax returns were not submitted by the end of the 2008 tax year (SARS, 2016a: 406).

Empirical evidence on the efficacy of deterrence measures is mixed. For instance Slemrod, Blumenthal & Christian (2001), Park & Hyun (2003) and Kleven, Knudsen, Kreiner, Pedersen & Saez (2011) found a positive relationship between deterrence measures and compliance, whilst Gangl, Torgler, Kirchler & Hofmann (2014), Modugu & Anyaduba (2014) and Mohdali, Isa & Yusoff (2014) found a negative relationship. However, these studies were mainly drawn from developed country applications and, as such, evidence from developing countries is limited (particularly for South Africa). The divergence in the empirical evidence seems to suggest that the effect of audits and penalty vary from country to country, which could be due to country or cultural differences (see Cummings *et al.*, 2009; Alm *et al.*, 2016), making it imperative to expand the investigation to developing countries as well. Moreover, existing studies have largely been focused on personal income in its aggregated form (a combination of salaried and non-salaried income). Considering that compliance varies with the type of income, as confirmed by findings from the tax gap analysis (see Section 3.6.3), investigating tax behaviour using aggregated income may conceal some important

evidence, making it difficult to address the country's tax gap, which is highly composed of non-compliance by non-salaried taxpayers. In other words, it is likely that the impact of deterrence measures on compliance would depend on the taxpayers' source of income (salaried and non-salaried). Examining the efficacy of deterrence measures using aggregated income may therefore provide little insight on how to address the tax gap, and could be one source of divergence in empirical studies.

In light of the foregoing discussion, this study employed a controlled laboratory experiment to examine salaried and non-salaried taxpayers' behavioural responses to changes in audit and penalty rates in South Africa. An experimental setting provided the flexibility to vary variables individually, whilst allowing for replication, thereby generating data that were more reliable than those derived from a naturally occurring world (see Section 4.2). Given that previous studies have largely been focused on total income, results from this study could contribute to tax policy design on the use of audits and penalties, so as to increase tax compliance for both salaried and non-salaried individual taxpayers.

The rest of this chapter is structured as follows: Section 5.2 provides an overview of the theoretical foundations on the economic deterrence framework. The empirical evidence of deterrence measures is discussed in Section 5.3. Section 5.4 discusses the application of deterrence measures in the South African tax system. Section 5.5 discusses the methodological approach for this study. Section 5.6 discusses the findings and Section 5.7 provides the conclusion and the policy implications drawn from the study.

5.2   THEORETICAL FOUNDATIONS: THE ECONOMIC DETERRENCE FRAMEWORK

The standard economic deterrent theory stems from the economics-of-crime model developed by Becker (1968). This model argued that crime was an economic activity that could be countered by punishing the offender. Becker (1968) stated that the severity of punishment and the probability of being punished were equally effective tools in controlling bad behaviour. Based on the economics-of-crime model, Allingham & Sandmo (1972) developed the deterrence model to explain taxpayer behaviour. The Allingham and Sandmo (A-S) model was later extended by Yitzhaki (1974) (hereafter abbreviated as the A-S & Y model).

The A-S &Y model viewed individuals as homogenous, egoistic and utility maximisers whose decision to pay taxes was arrived at after evaluating the gains of successful evasion vis-à-vis the risk of detection and punishment. An individual evades whenever the benefits of cheating outweighs the risk of detection and the accompanying punishment. The central argument of this model was that an individual complied due to fear of detection and punishment. As such, the more stringent the deterrent measures, the more compliant taxpayers become.

In its simplest form, the model can be illustrated[23] as follows: assume that an individual receives a fixed gross income (Y) which is supposed to be declared to the tax authority for tax purposes. The reported income is taxed at a rate (t). Assume again that the individual declares (X) amount of income, implying that his or her undeclared income is (Y - X). Although no taxes are paid on unreported income, the individual may be audited for under-reporting at a fixed and random probability of (p), where $0 < p < 1$. Once audited, all unreported income is detected and the delinquent individual pays a penalty (α), where α > 1. The penalty is calculated as a multiple of the evaded tax amount. When evasion is undetected, the individual's net income (W) is the difference between gross income and the tax paid from declared income. That is:

$$W = Y - tX \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{ (8)}$$

In the event that the evaded amount is detected, the individual's net income (*Q*) becomes gross income *minus* paid taxes, *minus* the fine on unpaid taxes. That is:

$$Q = Y - tX - \alpha[t(Y - X)] \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{ (9)}$$

With the probability of detection, *p*, the individual chooses to declare *X* to maximise his/her expected utility, *E*[*U*(*Y*)], expressed as:

$$E[U(Y)] = (1 - p)U(W) + pU(Q) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{ (10)}$$

Where *E* is the expectation operator and *U(Y)* is the utility function of income.

If the individual is risk-averse, his or her utility function will be concave, which implies that the first and second order conditions will be satisfied. These are expressed by equations (11) and (12) as follows:

$$pt(\alpha - 1)U'(Q) - (1 - p)tU'(W) = 0 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{ (11)}$$

$$p[t(\alpha - 1)]^2 U''(Q) + (1 - p)t^2 U''(W) < 0 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{ (12)},$$

Where U' and U'' denotes the first and second derivatives of the utility function, respectively.

Equation (11) is the basic deterrent (or portfolio) model of tax compliance. Total differentiation of this equation allows us to see the effect of each parameter on compliance. The total differentiation of the first-order equation with respect to the probability of the audit rate and the penalty rate produce equations (13) and (14), respectively:

$$\frac{\partial X}{\partial p} = -\left[\frac{t(\alpha-1)U'(Q)+tU'(W)}{pt^2(\alpha-1)^2U''(Q)+(1-p)t^2U''(W)}\right] \dots\dots \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{ (13)}$$

$$\frac{\partial X}{\partial \alpha} = -\left[\frac{ptU'(Q)}{pt^2(\alpha-1)^2U''(Q)+(1-p)t^2U''(W)}\right] \dots\dots \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{ (14)}$$

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[23] The illustration follows Alm, Jackson & Mckee (2009).

Equation (13) shows that an increase in the audit rate leads taxpayers to increase their declared income. Likewise, equation (14) depicts a positive relationship between compliance and the penalty rate. Thus, higher audit rates and penalty rates discourage taxpayers from evading. In light of these theoretical arguments, the next Section reviews the empirical findings on the effect of audit rates and penalty rates on compliance.

5.3   EMPIRICAL STUDIES: THE EFFICACY OF DETERRENCE MEASURES

Despite the wide use of audits and penalties as tax enforcement mechanisms, empirical evidence on their efficacy are diverse. Evidence on the effects of audits and penalties on compliance is three-pronged: some studies show that audits and penalties have a positive effect on compliance and others established that these measures reduce compliance, while other researchers found audits and penalties to have no (or minimal) effect on compliance. This Section discusses the findings from empirical studies on the effect of audits and penalty rates on compliance.

5.3.1   Increased compliance

Slemrod *et al.* (2001) conducted a field experiment to examine how differences in taxpayers' perceptions on audits affect tax compliance in Minnesota. In the study, letters were sent to a group of taxpayers and they were advised that their returns (which they were going to submit) would be thoroughly audited. The reaction of taxpayers in the treatment group was matched against the control group (who did not receive the letter nor any audit information). The study established that the effect of audit threats depended on taxpayers' opportunities to evade, as well as their level of income. More specifically, the low to medium income earners were relatively more compliant in response to audit threats. Conversely, high-income taxpayers reduced their compliance levels. The authors attributed this finding to the fact that most high-income individuals were more likely to have professional tax assistants who would help them to avoid and evade taxes, regardless of increases in audit rates. Although the results from this study were plausible, it would be more informing to establish the effect of audits on taxpayers by the type of income they hold (e.g. salaried vs. non-salaried).

Using experimental data, Park & Hyun (2003) examined the determinants of tax compliance in Korea. The experiment was run with 15 undergraduate students. The study established that increases in penalty and audit rates incentivised taxpayers to increase their compliance levels. Penalty rates were found to be more of a compliance-enforcement instrument than audits. Contrary to Slemrod *et al.* (2001), Park & Hyun (2003) found that disparity in individuals' income levels had no effect on compliance. However, considering that the study used a very small sample, it would be necessary to verify these findings using a larger sample size.

Kleven *et al.* (2011) explored how audits influenced individual taxpayers' compliance in Denmark, using a sample of 42 800 taxpayers and comparing self-reporters and third-party reporters. The experiment was undertaken over two years. In the first year, 21 400 randomly selected taxpayers

were audited, without any prior information to the exercise. In the second year, subjects were randomly assigned to three different treatment groups. The first group was served with letters threatening that everyone was going to be audited. The second treatment group was served with letters indicating that half of the subjects were going to be audited. The last group did not receive any letters. The study found a positive relationship between audit rates and compliance on self-reported income. Conversely, audits were found to have no effect on third-party reported income.

Asnawi (2016) explored the effect of deterrent measures on compliance in Indonesia. The study employed a controlled laboratory experiment with 156 student subjects drawn from three majors: accounting, management and economics. Subjects were randomly selected into two audit strategy groups: fixed and random strategies. Under a fixed audit strategy, auditing would be limited to those taxpayers who would have been audited in the initial tax reporting period. In the random audit strategy, taxpayers were randomly audited in every reporting period. The audit rate treatment was classified into four audit levels: an uninformed audit rate, 10 percent, 20 percent and 30 percent. This study established that a taxpayer complied more when subjected to a random audit strategy than when subjected to a fixed audit strategy. The author argued that, contrary to a fixed audit, a random audit is associated with high audit uncertainty, which incentivises taxpayers to comply (Asnawi, 2016: 18). The study established that compliance levels did not change when the audit rate was increased from 10 to 20 percent, though it significantly increased when the audit rate was increased from 10 to 30 percent. These findings suggested that the tax authority should institute higher audit rates to incentivise taxpayers to increase their compliance levels.

Cummings *et al.* (2009) conducted artefactual field experiments to investigate the effect of cultural differences on compliance behaviour in Botswana and South Africa, countries with substantially different political histories and records of governance quality. More specifically, the study sought to investigate whether cross-cultural differences in tax compliance behaviour had foundations in the institutions of tax administration and citizen assessment of the quality of governance. The experiments were conducted with 99 participants in South Africa and 88 participants in Botswana. In both cases, the subjects constituted university staff and students, with the experimental setting replicating most of the elements of the basic structure of personal income systems in these countries. In the experiment, subjects received some income that they would report to the tax authority voluntarily for tax purposes, and faced a probability of audit (Cummings *et al.*, 2009: 452). Those detected to have evaded were penalised. Importantly, the experiment was context-rich[24], emphasising cultural factors and social norms to induce taxpayers to incorporate these factors in their reporting decisions. The study established that cultural factors and social norms have an influence on compliance. It was also established that audits and penalties influenced taxpayers' increase in compliance. It would, however, be more informative if this study could be extended to

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[24] The experiment used explicit tax terms.

investigate the effect of audits and penalties on disaggregated individual income (i.e. salaried and non-salaried incomes).

5.3.2   Reduced compliance

Gangl *et al.* (2014) conducted a field experiment exploring the effect of stringent enforcement (close supervision[25] and frequent audits) on tax compliance in Austria. Their population sample was constituted of 1 721 newly established small firms, operating in sectors prone to high non-compliance (including gastronomy, construction, trading, mining and counselling). Companies in the treatment group were constantly supervised and monitored by an auditor, who would guide them in tax filing. The auditor would also inform the taxpayers about the benefits of paying taxes. Taxpayers were also informed that they would be audited on a monthly basis, throughout the year. In contrast, firms in the control group were purposely neither approached nor audited. The study found that extreme enforcement (close supervision and frequent audits) reduced compliance, even in cases of strong and cordial taxpayer-tax authority relationships. These findings suggested that excessive enforcement reduced taxpayers' trust in the authority, which reduced their intrinsic motivation to comply, causing them to evade. However, the study focused on corporate income taxpayers; making it imperative to investigate whether or not these findings apply to individual taxpayers as well.

Modugu & Anyaduba (2014) examined factors that influenced tax compliance in Nigeria. Using survey data of corporate income taxpayers from five regional zones of Nigeria, the study found a positive but weak relationship between audit rates and the level of compliance. Penalties were found to have a significant and negative effect on compliance. Modugu & Anyaduba (2014: 212) attributed the negative relationship between penalty rates and the compliance rate to poor enforcement of penalties in Nigeria. Thus, due to poor enforcement, penalties did not deter taxpayers from evading.

Wahl, Kastlunger & Kirchler (2010) used laboratory and online experiments to investigate the effect of enforcement (audits and penalties) on compliance. The laboratory experiment was conducted with 120 student subjects. An online experiment was conducted with a sample of 186 self-employed individuals, and was meant to replicate and validate the findings of the laboratory experiment. Results from this study were two-fold. On the one hand, it was established that increases in enforcement persuaded dishonest taxpayers (taxpayers with a high inclination towards evading) to increase their compliance levels. The study stated that dishonest taxpayers regarded increases in enforcement as a sign that the authority was committed to combat evasion. This perception triggered taxpayers to increase their compliance levels. On the other hand, the study established that honest taxpayers reduced their compliance levels when subjected to high audit and penalty rates. The authors highlighted that honest taxpayers perceived high audits and penalties as a sign of mistrust

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[25] Supervision is defined as a friendly and constant form of deterrence and interaction with the taxpayers (Gangl *et al.*, 2014: 379).

by the tax authority. Such perception by the taxpayers reduced their intrinsic willingness to comply and, hence, a negative correlation between enforcement and voluntary compliance was evident.

Mohdali *et al*. (2014) conducted drop-off and online surveys to investigate the effect of threat of punishment (comprised of audits and penalties) on tax compliance behaviour in Malaysia. The study found that audits and penalties triggered honest taxpayers to evade. It was suggested that honest taxpayers would perceive threats of punishment as a sign of mistrust by the authorities. As trust is reciprocal in nature, taxpayers' trust in the authority would decline, leading to a reduction in compliance. This finding confirmed the results of Wahl *et al*. (2010). As is the case in Wahl *et al*. (2010), Mohdali *et al*. (2014) did not establish the level of audits and penalties that trigger a change in compliance levels. Further, it would be more informative if this study established the effect of audits and penalties on disaggregated income (e.g. salaried and non-salaried income).

5.3.3   No impact on compliance

Alm, Jackson & McKee (1992) employed a series of laboratory experiments to establish the effect of audit, penalty rates and changes in government expenditures on personal income taxpayers' compliance in the U.S. Although the results showed that both audits and penalties had a positive effect on compliance, the significance level of the coefficients was very low. The authors attributed the low significance of penalty rates to the tax authority's inability to detect non-compliance. They suggested that increases in penalty rates could be effective in dissuading taxpayers from cheating, only when the tax authority was able to detect non-compliance. However, the study highlighted that, given the challenges in raising the detection rates, there was limited scope to improve compliance through penalties. As such, the study concluded that greater penalties may be largely ineffective in enhancing compliance. Although findings from this study seemed plausible, it is worth noting that the experimental exercise was undertaken with a relatively small sample of 40 subjects. For greater statistical power, it would be imperative to run such an experiment with a bigger sample size.

Using data obtained from various regulatory agencies[26], Devos (2004) employed a time-series analysis to investigate the impact of penalties in mitigating tax evasion in selected Anglo-Saxon countries, including the UK, New Zealand and Australia. This study was undertaken following the introduction of a raft of changes to the penalty structure of the Anglo-Saxon countries' tax systems. These changes included the introduction of new penalties and the imposition of harsher sanctions for existing offences. The study found that penalties had no effect on compliance.

In light of the foregoing discussion, it is clear that empirical evidence on the effect of deterrence measures, particularly penalties and audits, is diverse. Notwithstanding this divergence in empirical

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[26] These included the Australian Taxation Office (ATO) and the Commonwealth Director of Public Prosecutions (DPP), the New Zealand Inland Revenue Department (IRD) and the Ministry of Justice (MOJ) and the British Board of Inland Revenue (BIR).

evidence, audits and penalties constitute compliance-enforcement mechanisms across many countries.

5.4   DETERRENCE MEASURES IN SOUTH AFRICA

Tax evasion is treated as a serious offence in South Africa. Depending on the nature and extent of the offence, tax evaders will pay pecuniary penalties and/or serve a jail sentence. The financial penalties are in three forms: administrative penalties, understatement penalties and non-compliant interest (see Section 2.4.1 for detail). The administrative penalty was introduced in 2009, following an upsurge in the number of late submissions; it was intended mainly to promote compliance with the administrative provisions of the tax legislation. There are two categories of administrative penalties: fixed amounts and percentage-based penalties. Fixed amount penalties are levied on individual taxpayers who fail to meet submission deadlines. The penalty is calculated per month, at a fixed rate. Depending on the individual's taxable income, the penalty ranges between R250 and R16 000[27]. Apart from fixed-amount penalties, taxpayers are levied a percentage-based administrative penalty on the late or non-payment of taxes. Depending on the gravity of the offence, the penalty ranges between 10 and 200 percent (refer to Table 2.2).

As previously discussed in (Section 2.4.1), besides administrative and underpayment penalties, non-compliant taxpayers are liable to pay interest, fixed at 9.75 percent per annum. This penalty is levied for both late- and under-payment. Depending on the seriousness of the offence, failure to comply with the requirements of the tax laws may constitute a criminal offence. Examples of criminal offences include intentional evasion, claiming undue refunds, or assisting a taxpayer in such endeavours (SARS, 2016b: 15). If convicted, the offender pays a fine and/or is incarcerated. For instance, over the 2014/15 fiscal year, 256 taxpayers were convicted in cases involving R196 million of evasion. The convictions involved different crimes: 73 were for income tax fraud, 32 were for VAT fraud and eight for tobacco-related crimes, among others (SARS, 2015: 1). They were fined R9.6 million and given an effective 555 years in jail (SARS, 2015: 1).

In its pursuit to enforce compliance, the government also exploited high profile tax evasion cases to reinforce its strict stance against non-compliance. For instance, in 1999, Trevor Tutu (son to Archbishop Desmond Tutu, a renowned South African Anglican cleric and Nobel Peace Prize winner) was convicted of tax evasion and was sentenced to one year in prison (Cummings *et al.*, 2009: 449).

South Africa's penalty structures are comparatively more stringent than those of other countries in the region. For instance, in Zambia negligent understatement currently carries a penalty of 17 percent of the amount evaded, whilst wilful default and fraud respectively carry a penalty of 35 and 52.5 percent of the amount evaded (ZRA, 2018). In Kenya, late payment of tax constitutes a penalty of 20 percent of the unpaid amount, with intentional understatement of taxes carrying a penalty of

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[27] This rate has not been changed since its inception in 2009.

75 percent of the amount evaded. In Zimbabwe, the late payment penalty constitutes $30 for each day of the first 181 days the return remains outstanding. Where the return remains outstanding beyond 181 days, prosecution may be instituted (ZIMRA, 2018).

In view of the foregoing discussion, it is clear that South Africa relies heavily on deterrence measures as a compliance-enforcement mechanism. However, empirical evidence on the effect of deterrence measures (particularly penalties and audits) is diverse, and is largely based on developed country applications (see Section 5.3). There is limited evidence from developing country applications, particularly also for South Africa. Furthermore, existing research has largely been focused on personal income in its broad nature (combined salaried and non-salaried income). Considering that tax evasion varies with the type of income, examining the efficacy of deterrence factors based on aggregated income may conceal some important evidence. As such, this could be one of the likely sources of divergence in empirical findings. With the divergence in empirical evidence, it remains a challenge for policymakers to formulate effective compliance-enforcement mechanisms. It is against this backdrop that this study sought to investigate the effect of audit and penalty rates on salaried and non-salaried taxpayers. Considering that salaried and non-salaried taxpayers exhibit different compliance rates (see Section 3.6.3), the disaggregation of the effects of deterrent measures by type of income (salaried and non-salaried income) can provide useful information on how audits and penalties can be used to stimulate tax compliance. Essentially, the disaggregation of the effects of deterrence factors by the type of income will help the authorities to effectively reduce the PIT gap, which is largely composed of provisional taxpayers (refer to Table 3.4).

5.5   METHODOLOGICAL APPROACH

Tax evasion is an illegal activity. As such, delinquents conceal their actions to avoid the consequential results associated with non-compliance, making it difficult to observe or get detailed data on evasion in a naturally occurring world (Alm, 2012: 56). It is therefore difficult to draw reliable inferences on how taxpayers respond to changes in tax instruments, based on happenstance data (data drawn from a naturally occurring setting). In light of these challenges, this study employed a conventional laboratory experiment to investigate individual taxpayers' behavioural responses to changes in audit and penalty rates. Laboratory experiments allowed factors suggested by theory to be tested individually and independently in a controlled environment, providing an investigator with a better opportunity to generate data that can provide useful information on the effect of audits and penalties on taxpayers' compliance behaviour (see Section 4.3).

5.5.1   Experimental design

The experimental setting for this study replicated the essential features of the voluntary reporting system of South Africa's PIT. The experimental design followed Alm, Deskins & McKee (2009), who examined individual taxpayers' compliance responses to changes in the proportion of salaried and

non-salaried income. In this study, subjects would have two forms of income: endowment[28] and earned (salaried) income. This disaggregation of income is in line with the tax gap analysis, where this distinction in the composition of income is important to estimate the extent of evasion (see Section 3.6.3).

The endowment was randomly assigned to subjects at the beginning of the experiment. Subjects then earned some additional income by performing the simple task of counting the frequency of one (1) in a grid in the shortest possible time. The amount earned was determined by one's performance in the task. The subject's income (endowment plus earned income) was only known by its holder. Both incomes were supposed to be reported to the tax authority for tax purposes and were taxed at the same rate, which is fixed at 30 percent[29]. Subjects then filled in a tax return, choosing how much of their endowment and salaried income to report. The tax liability was calculated based on the proportions of reported salaried and non-salaried income. Importantly, tax was paid only on reported income. The distribution of income is shown in Table 5.1.

Participants were subjected to random audits to uncover any unreported income, and audit rates were pre-announced to the subjects. As in many other studies (Alm, Deskins & McKee, 2009; Alm, Bloomquist & McKee, 2013; Alm, Bernasconi, Laury, Lee & Wallace, 2016; Zhang, Andrighetto, Ottone, Ponzano & Steinmo, 2013), audits were limited to the present round (previous rounds were not included in the audit). Audits were determined by a virtual bingo cage displayed on every participant's computer screen. More specifically, after every tax period, a box with red and white balls appeared on the screens (see Appendix B). These balls would bounce for a while before one popped out of the box. If a red ball popped out, the subject would be audited. Conversely, a white ball implied no audit (see Figure B.2).

Subjects were informed that any salaried income that was undeclared would be detected with certainty in the event of an audit. Any undeclared endowment income would be discovered in an audit, but only with some known and pre-announced probability, which was fixed at 50 percent[30]. The disparity in detection rates reflected the productivity of audits on each type of income (Alm *et al.*, 2009: 128). The detection rates used in this study are hypothetical. Intuitively, the discrepancy in compliance rates could largely be attributed to the difference in detectability between these incomes. Salary payments usually leave paper and electronic trails, while non-salaried income, however, is largely transacted in cash, leaving no transactional evidence (see Schneider, 2005; Ahmed & Rider, 2013; Artavanis, Morse & Tsoutsoura, 2015; Paulus, 2015). Thus, it is more difficult to detect misreporting on non-salaried income. Unlike salaried income, which is reported through a

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[28] An endowment represents non-salaried income (e.g. self-employed income, rental income, capital gains, donations and investment income).

[29] 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 be comparable with other studies'.

[30] The instructions sheets are shown in Appendix D and were developed from Alm, Bernasconi, Laury, Lee & Wallace (2016).

third party, non-salaried income is self-reported, thereby providing non-salaried income taxpayers more opportunities to misreport. Accordingly, the disparity in the detection rates captured the fundamental elements of third-party and self-reporting systems (see Alm *et al.*, 2009: 128–129). If an under-statement was detected, the delinquent taxpayer paid a penalty. The penalty was calculated as a multiple of unpaid taxes of the audited round.

Table 5.1: Income distribution

Session	Descriptive statistic	Income type		
		Non-salaried income	Salaried income	Total income
1	Mean	137.68	132.73	270.41
	Std. Dev	22.04	34.27	40.04
	Min	100	0	145
	Max	175	210	383
2	Mean	138.39	127.96	266.36
	Std. Dev	21.79	45.61	50.09
	Min	100	0	137
	Max	175	210	382
3	Mean	136.46	119.14	255.60
	Std. Dev	19.95	40.75	45.74
	Min	100	0	126
	Max	175	210	382
4	Mean	137.3	122	259.3
	Std. Dev	21.57	40.42	44.87
	Min	100	0	101
	Max	175	210	374
Total	Mean	137.42	125.52	262.95
	Std. Dev	21.3	40.5	45.43
	Min	100	0	101
	Max	175	210	383

Source: Author's own calculations.

Subjects were spaced in a computer laboratory to such an extent that they could not communicate, nor access each other's information displayed on computer screens. They were also informed that the investigator would not be observing their compliance decisions and 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). More so, subjects were informed through consent forms that no personal identification would be collected. As such, each subject was randomly assigned a number for identification purposes to ensure that their responses were anonymous.

The experimental exercise was context-rich, in that it employed explicit tax terms. This helped subjects to contextualise the exercise, and prevented them from regarding the experiment as a mere game (see Torgler, Schaffner & Macintyre, 2009). This was necessary to ensure that the experiment was internally valid, where internal validity referred to whether the data permitted correct causal inferences, and was a result of proper experimental controls (Friedman & Sunder, 1994: 5). Contextualisation of the experimental setting also provided for the necessary extent of parallelism to the real world, which was key when it came to the external validity of experimental results. External validity refers to the extent to which the laboratory results can be generalised to the broader population (Friedman & Sunder, 1994: 5).

In this study, the experimental exercise comprised of four sessions, each made up of ten rounds. In Session One (the control session), the audit and penalty rates were set at 10 and 150 percent, respectively, and retained for all rounds. The audit and penalty rates were set and retained at the Session One levels for Rounds One to Five, for all the remaining Sessions. In Session Two, the penalty rate was increased to 300 percent from Round Six up to Round Ten. In Session Three, the audit rate was increased to 30 percent for Rounds Six to Ten. To examine the joint effect of high audit rates and high penalty rates, both of these parameters were increased in Session Four from Round Six to Round Ten. The audit rate was increased to 30 percent, while the penalty rate was increased to 300 percent. Importantly, subjects would take part in one Session (composed of ten rounds). Parameters for the Sessions are summarised in Table 5.2:

Table 5.2: Parameters of the Experimental Design

Session	Rounds	Audit rate	Probability of Detection (Salaried income)	Probability of Detection (Non-salaried income)	Penalty rate	Tax rate
1	1-10	10%	100%	50%	150%	30%
2	1-5	10%	100%	50%	150%	30%
	6-10	10%	100%	50%	300%	30%
3	1-5	10%	100%	50%	150%	30%
	6-10	30%	100%	50%	150%	30%
4	1-5	10%	100%	50%	150%	30%
	6-10	30%	100%	50%	300%	30%

Source: Author's own calculations.

In sum, the experiment used the same parameters in Rounds One to Five across all sessions to ensure that behavioural differences were controlled by allowing each subject to be their own control. At the same time, treatments were varied across sessions (from Session Six to Session Ten) to compare the behaviour of subjects across treatments, making each session a 'control' for the other. This was necessary to benefit from the strengths of a within-subject and between-subject

experimental designs, which include improving the statistical power of the experimental data and reducing the impact of order effects resulting from a purely within-subject experimental design (refer to Section 4.5.2).

All sessions were computer-aided, and programmed with z-Tree (Fischbacher, 2007). Subjects' tax liabilities, tax owed and penalties (if any) were automatically calculated and displayed on the screen. A tax calculator was displayed on the computer screen and it provided subjects with an opportunity to view the earnings implications of their reporting decisions (if audited and if not audited) before making the final decision[31]. Subjects could also view their previous tax returns before filing another one. To make sure that subjects understood the exercise, two practice sessions were conducted at the beginning of the experiment, allowing them to seek clarity before working on the actual rounds. They were informed that their performance in the practice sessions did not contribute towards payment.

Despite subjects' participation in ten rounds, only one round counted towards earnings[32]. This is determined by rolling a ten-sided die at the end of the exercise. Thus, all rounds had an equal chance of being selected and no one knew in advance which one would be chosen. Once the payment round was determined, subjects were paid their earnings in cash. A subject's net income (after-tax income) depended on the following: the size of the tax rate, amount of random endowment and earnings in the task performed (i.e. composition of income), penalty rate and whether the unreported income was detected or not. The net income for a round is represented by the following equation:

$$Net\ income = Y - tY[Sr_s + (1-S)r_e] - AftY[S(1-r_s) + D(1-S)(1-r_e)]\dots\dots\dots\dots\dots(15)$$

Where:

- Y = gross income (i.e. salaried plus endowment income);
- t = tax rate;
- S = share of salaried income in gross income;
- rs = share of salaried income reported by the subject;
- re = share of non-salaried income reported by the subject;
- A = dummy variable, 1 if the subject is audited and 0 if otherwise;
- f = penalty (fine) rate on undeclared taxes; and
- D = dummy variable, 1 if the subject is detected for underreporting non-salaried income, and 0 if otherwise.

At the end of the experiment, subjects completed a demographic questionnaire. This helped to capture subjects' socio-economic and demographic data, which was essential in empirical analysis

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[31] Figure B.1 (in Appendix C) provides a screenshot of the tax calculator.
[32] Earnings were from only one round as a cost cutting measure on the part of the investigator.

(see Torgler & Schaltegger, 2005; Alm *et al.*, 2009; Alm, Bernasconi, Laury, Lee & Wallace, 2016). A copy of the questionnaire is depicted in Appendix F.

The experiment was conducted at Stellenbosch University with students drawn from different disciplines[33]. All participants had no prior exposure to laboratory experiments. They were recruited via electronic invitations and class presentations.

5.5.2   Behavioural hypotheses

The experimental setting described above allows for the investigation of a number of behavioural hypotheses on the effect of audits and penalties on both salaried and non-salaried taxpayers. These are outlined as follows:

Hypothesis 1: *There is a positive relationship between audit rates and salaried income tax compliance.*

Hypothesis 2: *There is a positive relationship between penalty rates and salaried income tax compliance.*

Hypothesis 3: *There is a positive relationship between audit rates and non-salaried income tax compliance.*

Hypothesis 4: *There is a positive relationship between penalty rates and non-salaried income tax compliance.*

Hypothesis 5: *Having been audited in the previous tax year influences taxpayers to increase their compliance rates in the subsequent year.*

The deterrence model postulates that individuals are utility maximisers, whose decision to pay taxes is arrived at after evaluating the costs and benefits of evading. Audits and penalties are therefore expected to reduce the expected value of evasion, causing taxpayers to increase their compliance levels. Thus, the afore-mentioned hypotheses, particularly on the deterrent effects of audits and penalty rates are validated by contrasting the expected value (EV) an individual derives when he or she complies, with the tax requirements against the EV derived from evading (Alm *et al.*, 2009: 131). In this regard, assume that an individual is risk-neutral and egocentric, such that his or her choice on whether to pay or evade taxes is based on the need to get the maximum value from the compliance gamble. His or her expected value from complying (reporting all income) is:

$$EV\ (Compliance) = (1 - p^*)(Y - tD) + p^*\big(Y - tD - ft(Y - D)\big) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(16)$$

Where:

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[33]The sample constitutes undergraduate (excluding first years) and post-graduate students. The appropriateness of students in experimental methods is discussed in Section 4.4.

- p^* is the effective probability rate of being audited[34];

- Y is the true income;

- t is the tax rate;

- D is the declared amount; and

- f is the fine rate on unpaid taxes.

The expected value derived from not complying is:

$$EV\ (Evading) = (1 - p^*)Y + p^*(Y - ftY) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots . . \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots . (17)$$

Intuitively, an individual is expected to choose the bundle that provides more gains (Alm *et al.*, 2009: 132). For instance, the individual evades whenever the expected value from evading is greater than the expected value from complying. Thus, the difference between EV (Evasion) and EV (Compliance) provides a benchmark on whether a taxpayer would comply or evade.

Table 5.3 shows the difference between expected values from compliance and expected values from non-compliance, for both salaried and non-salaried income. The calculations are based on parameters from the experimental design and on a hypothetical gross income of R100.

Table 5.3: Effects of audits, detections and penalties on expected values

Salaried Income				
Tax Rate	**Audit Rate**	**Penalty Rate**	**Probability of Detection**	**EV Compliance less EV Evading**
30	10	1.5	100	-22.5
30	10	3	100	-18.0
30	30	1.5	100	-7.5
30	30	3	100	6.0
Non-Salaried Income				
Tax Rate	**Audit Rate**	**Penalty Rate**	**Probability of Detection**	**EV Compliance less EV Evading**
30	10	1.5	50	-26.3
30	10	3	50	-24.0
30	30	1.5	50	-18.8
30	30	3	50	-12.0

Source: Author's own calculations.

The differences in expected values indicate whether it is beneficial for an individual to comply or evade. A negative difference between the expected value for complying and the expected value for

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[34] The effective probability rate is the product of the probability of an audit and the detection rate (Alm *et al.*, 2009; Alm, Bloomquist & Mckee, 2013).

evading implies that it is more beneficial to evade than to comply. The opposite holds for a positive difference between these expected values.

It is evident from Table 5.3 that an individual would evade in most cases, as reflected by the negative discrepancies between the expected value from complying and that from evading. Importantly, this illustration is based on the assumption that the subjects are risk-neutral. Allowing for heterogeneity of risk attitude would affect the optimal choice but not the qualitative predictions with respect to the direction of treatment effects. As suggested by the deterrence theory, the expected value from evading declines as deterrent parameters increase, leading to a positive discrepancy between the expected value from compliance and the expected value from non-compliance. This, therefore, suggests that there is a negative relationship between non-compliance and audit and penalty rates. Table 5.3 also shows that expected values derived from evading vary between the two incomes (see also Alm *et al.*, 2009: 132). An individual derives less expected value from evading salaried income tax than from evading non-salaried income tax. The discrepancy between these expected values can be attributed to the disparity of detection rates between these incomes. As previously discussed (in Section 5.5.1), it is relatively more difficult to detect the evasion on non-salaried compared to that on salaried income. A rational individual would therefore evade more on non-salaried income, since such income bears a lower probability of detection if audited (see also Alm *et al.*, 2009: 132–133).

5.5.3   Analytical approach

To examine the conjectures discussed above, this study examined descriptive statistics of the experimental results on the effect of audit and penalty rates on compliance. Subjects' compliance (i.e. compliance rate) was defined as the ratio of reported income to total income. The experiment was conducted with panels of subjects: as such, the study employed a panel regression analysis to establish specific causal inferences between compliance and audits and penalties. The panel regression allowed the investigator to control for variables that are unobservable (or unmeasurable) and those that change over time but not across individuals. Thus, panel regression accounted for individual heterogeneity. In light of this discussion, the primary model for this study consisted of the following random effects panel regression model[35]:

$$C_{ist} = \beta_0 + \beta_1 Totalincome_{ist} + \beta_2 Nonsalincomeshare_{ist} + \beta_3 Auditrate_{st} + \beta_4 Penaltyrate_{st} +$$
$$\beta_5 PrevAudit_{ist} + \beta_6 Auditrate_{st} * Penaltyrate_{st} + \beta_7 Round_s + \beta_8 Z_i + \lambda_{st} + \mu_i + \varepsilon_{ist} \ldots\ldots\ldots\ldots(18)$$

Where:

- C_{ist} is the compliance rate for individual *i* in group (session) *s* at time (round) *t*;
- *Totalincome* is the total amount of income (salaried plus non-salaried) of the subject; This is meant to examine the effect of total income on compliance;

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[35] Steps taken to determine the type of panel regression model are discussed in Section 5.6.3.

- *Nonsalincomeshare* is the share of non-salaried income in the gross income. This is essential in establishing the relationship between compliance and the composition of income;

- *Auditrate* is the probability of an audit in a round. The variable seeks to examine how taxpayers respond to changes in the audit rate;

- *Penaltyrate* is the penalty rate levied on detected evaders, and it seeks to establish the relationship between the compliance rate and the penalty rate;

- *PrevAudit* is a binary variable equal to 1 if the subject was audited in the previous round, and 0 if otherwise. The variable seeks to establish the relationship between previous audits and the compliance rate in subsequent periods;

- *Auditrate*Penaltyrate* is the interactive term for audit and penalty rates. This seeks to establish the joint effect of the probability of an audit and the penalty rate on the compliance rate;

- *Round* is round period in every session and captures round effects on the compliance rate. Round effects may include subjects' experimental experience gained in between rounds. The round variable therefore controls for the effect of previous rounds on subsequent rounds. As such, it is a control variable;

- *Z* is a vector of demographic variables, which include age, ethnicity, religion, work experience, current level of study, family annual income level and marital status. These variables control for the effect of subjects' idiosyncrasies in the regression model;

- λ is a set of T-1 variables that capture the potential of non-linear period effects;

- μ are random effects that control for unobservable individual characteristics; and

- ε is the error term with a zero mean and constant variance.

The dependent variable (compliance rate) took three forms: compliance on non-salaried income, compliance on salaried income, and compliance on total income. This allowed for a comprehensive examination of the effect of tax parameters on personal income compliance.

5.6   RESULTS

The experiment was conducted with a panel of 184 subjects, of whom 56 percent were male. The average age of the participants was 22 years old. The racial composition for the population sample was as follows: 43 percent white, 35 percent black, 15 percent coloured and 7 percent other races. Of the total subjects, 11 percent were Catholics, 21 percent Protestants, 3 percent Baptists while 21 percent had no religion. 11 percent of the participants had filed a tax return before. Each subject participated in only one session (where each session constituted 10 rounds), producing up to 1 840 individual observations. Table 5.4 provides summary statistics for the sample and Appendix A depicts the distribution of the subjects across sessions.

In preparation for the experimental exercise, a pilot experiment was conducted. Despite having a very successful pilot experiment, the substantive experiment encountered some internet server

glitches that caused the z-Tree program to freeze in the sixth round of the first three sessions. However, the experiment was successfully executed. Importantly, the glitches had no significant effect on subjects' responses, as shown by the t-test results depicted in Appendix G.

Table 5.4: Sample summary statistics

Observations	1840
Percentage Male	56
Mean age	22
Percentage white	43
Percentage black	35
Percentage coloured	15
Percentage Other ethnic groups	7
Percentage Catholic	11
Percentage Baptist	3
Percentage Protestant	21
Percentage No religion	21
Other religions	44
Percentage once filed a tax return	11
Percentage South African citizens	78
Percentage currently employed	24

Source: Author's own calculations.

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

5.6.1 Descriptive statistics

This section provides and analyses the descriptive statistics from the experimental results, which was the first step towards examining the effect of audits and penalties on compliance. As previously discussed, compliance is measured as a income reported as the proportion of total (or gross) income an individual possesses. The analysis is applied to each type of income (salaried, non-salaried and total income).

In Session One (where audit and penalty rates were kept constant across rounds), subjects reported 45 percent of their non-salaried income and 74 percent on salaried income. The average compliance rate on total income (salaried plus non-salaried income) was 59 percent. In Session Two, the penalty rate increased from 150 to 300 percent. Compared to Session One (the baseline session), the average compliance rates increased to 55 percent for non-salaried and decreased to 68 percent for salaried income. These results seem to suggest that the effect of penalties varies with the type of income held by taxpayers. The average compliance rate on total income increased to 61 percent.

These findings suggested that there was a positive relationship between penalty rate and compliance. The average compliance rates per session are depicted in Table 5.5.

Table 5.5: Average compliance rates per session

Session	Treatment	Non-salaried income	Salaried income	Total income
1	No treatment	0.45	0.74	0.59
2	Higher penalty rate	0.55	0.68	0.61
3	Higher audit rate	0.56	0.76	0.65
4	Higher audit and penalty rates	0.62	0.84	0.72

Source: Author's own calculations.

In Session Three, the audit rate increased from 10 to 30 percent. Subsequently, compliance on non-salaried, salaried and total income respectively increased to 56, 76 and 65 percent, compared to Session One. These results suggested that there was a positive relation between audits and compliance rates. The results further suggested that audits were more effective in enforcing compliance than penalty rates.

In Session Four, audit and penalty rates increased from 10 to 30 percent and 150 to 300 percent, respectively. Compared to Session One, the average compliance rate increased to 62, 84 and 72 percent for non-salaried, salaried and total income, respectively. These results suggested that individual taxpayers increased their compliance rate when subjected to a combination of high audits and high penalty rates.

Importantly, Table 5.5 shows that individual taxpayers evaded more on non-salaried income than on salaried income; it applied across all sessions. This is further depicted in Table 5.6, which shows the overall mean compliance rates (i.e. compliance over all sessions).

Table 5.6: Descriptive statistics for overall compliance rates

	Observations	Mean	Standard Deviation	Min	Max
Compliance rate on non-salaried income	1 840	0.54	0.39	0	1
Compliance rate on salaried income	1 833	0.75	0.35	0	1
Compliance rate on total income	1 840	0.64	0.34	0	1

Source: Author's own calculations.

The overall mean compliance rate for non-salaried income was 0.54. This was lower than the compliance rate for salaried income, which was 0.75. The discrepancy in the compliance rates supported the notion that evading on salaried income yielded less value than evading on non-salaried income. Thus, a rational individual would evade more on non-salaried income than on

salaried income. The results seemed to confirm the finding that non-salaried taxpayers constitute the larger share of South Africa's tax gap (see section 3.6.3). The discrepancy between these compliance values could be attributed to the disparity of detection rates between these two types of incomes.

As previously discussed, the second stage of the analysis entailed conducting some regression analyses. This sought to establish detailed causal relationships between compliance and the treatment variables. The regression analysis is discussed in the next Section.

5.6.2   Regression analysis

A panel regression model was run for each type of income, to establish treatment effects at an individual level. To determine whether the model should control for random or fixed effects, a Hausman test was run. It tested whether the disturbances (unique errors) were correlated with the explanatory variables, under the null hypothesis that they were correlated. Importantly, across all model specifications, the tests produced p-values of 1.00. Hence, the study rejected the null hypotheses that random effects were consistent, indicating that the models should control for random effects.

It was also necessary to examine whether the study employ a random effects regression or a simple Ordinary Least Square regression. This was determined using the Breusch-Pagan Lagrangian multiplier (LM) test. The null hypothesis in the LM test was that variances across individuals were zero; there was no significant difference across units (i.e. no panel effect). Across all model specifications, the LM produced a p-value of 0.000, indicating that there was some variation across subjects. The study therefore rejected the null hypotheses and concluded that random effects models were appropriate. Results from the Hausman and Breusch-Pagan tests are shown in Appendix H.

For robustness checks, a variety of regression specifications were conducted. Model 1 (which is described in Section 5.5.3) was the principal regression model, from which other models were derived. In the second model specification (Model 2), total income and the ratio of non-salaried to total income were excluded. This analysed the robustness of the model, which was mainly constituted of deterrence measures and control variables (the key variables). Model 3 further excluded previous audits and round effects. This was to examine the robustness of the model when it was mainly constituted of the key research variables (audit and penalty rates).

In regression analyses, compliance can also be defined as a binary that takes the value of 1 if the subject fully complies and 0 if otherwise. Thus, it is possible to employ a binary regression model (e.g. logistic and probit models) to validate findings from the primary regression model. Considering that results from logistic and probit models are generally similar (Park, 2010; Torres-Reyna, 2017),

this study employed a logistic model as its fourth model specification (Model 4). The regression results are depicted in Table 5.7 and are mostly robust across all model specifications.

The results showed that threats of higher audit rates increased compliance rates. This applied to both salaried and non-salaried taxpayers. When exposed to a 30 percent audit rate, non-salaried taxpayers increased their compliance rate by 0.42 percentage points higher than when they were subjected to an audit rate of 10 percent. Similarly, when the audit rate was 30 percent, salaried income taxpayers increased their compliance rate by 0.30 percentage points higher than when the audit rate was 10 percent. Relative to the average compliance rates of 0.54 and 0.75 for salaried and non-salaried income taxpayers, respectively, these results showed that audits were an effective compliance enforcement instrument. Hence, the study did not reject the hypothesis that higher audit rates increased compliance. These findings strengthen the position by Dubin *et al.* (1990), Park & Hyun (2003), Alm *et al.* (2004) and Asnawi (2016), who found a positive relationship between audit rates and compliance rates.

The results also showed a positive relationship between penalties and compliance. Taxpayers respectively increased their salaried and non-salaried income compliance levels by 0.16 and 0.21 percentage points, when subjected to a 300 percent penalty rate (as opposed to being subjected to a 150 percent penalty rate). These findings suggested that penalties were an effective instrument to stimulate compliance. The study therefore did not reject the hypothesis that there was a positive relationship between penalty rates and compliance. However, although penalties were an effective compliance measure, their impact was relatively less than that of audits.

Table 5.7: Regression results: deterrence measures

Variables	Non-salaried compliance				Salaried compliance				Overall compliance			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Total income	-0.0005*** (0.000)			-0.008 (0.005)	-0.0003** (0.000)			-0.011 (0.008)	-0.0003*** (0.000)			-0.009 (0.007)
High audit rate	0.419*** (0.023)	0.419*** (0.023)	0.300*** (0.017)	15.55*** (2.680)	0.297*** (0.023)	0.305*** (0.023)	0.236*** (0.016)	22.57*** (5.702)	0.366*** (0.019)	0.363*** (0.019)	0.269*** (0.014)	20.85*** (4.773)
High penalty rate	0.213*** (0.024)	0.213*** (0.024)	0.069*** (0.019)	6.672*** (0.949)	0.163*** (0.024)	0.155*** (0.024)	0.056*** (0.018)	9.289*** (1.510)	0.192*** (0.020)	0.195*** (0.020)	0.072*** (0.015)	9.249*** (1.549)
High audit rate*High penalty rate	-0.065* (0.033)	-0.064* (0.034)	0.080** (0.031)	-8.949*** (3.163)	-0.148*** (0.033)	-0.156*** (0.033)	-0.062** (0.030)	_	-0.105*** (0.027)	-0.101*** (0.028)	0.019 (0.026)	_
Share of non-salaried income	-0.145** (0.060)			-0.752 (2.177)	0.203*** (0.062)			-1.263 (3.713)	-0.231*** (0.050)			-4.238 (2.993)
Audited in round $r-1$	0.125*** (0.013)	0.126*** (0.013)		3.182*** (0.633)	0.105*** (0.013)	0.104*** (0.013)		5.123*** (0.970)	0.115*** (0.011)	0.117*** (0.011)		4.828*** (0.918)
Audited in round $r-2$	0.027** (0.013)	0.030** (0.013)		1.216** (0.570)	0.029** (0.013)	0.031** (0.013)		0.664 (0.832)	0.024** (0.011)	0.026** (0.011)		0.496 (0.795)
Audited in round $r-3$	0.013 (0.013)	0.013 (0.014)		0.490 (0.564)	0.002 (0.013)	0.006 (0.013)		-0.250 (0.812)	0.009 (0.011)	0.007 (0.011)		-0.199 (0.809)
Audited in round $r-4$	-0.021 (0.014)	-0.020 (0.014)		0.430 (0.578)	-0.020 (0.014)	-0.006 (0.014)		-0.679 (0.839)	-0.015 (0.011)	-0.015 (0.011)		-0.474 (0.885)
Audited in round $r-5$	-0.006 (0.014)	-0.006 (0.014)		-0.083 (0.546)	-0.016 (0.013)	-0.016 (0.013)		-1.763** (0.810)	-0.013 (0.011)	-0.013 (0.011)		-1.156 (0.849)
Audited in round $r-6$	0.009 (0.013)	0.020 (0.013)		-0.491 (0.519)	0.001 (0.013)	0.002 (0.013)		-1.590* (0.851)	0.003 (0.011)	0.003 (0.011)		-1.335 (0.860)
Audited in round $r-7$	0.012 (0.014)	0.011 (0.014)		0.393 (0.541)	0.033** (0.013)	0.035*** (0.013)		0.768 (0.776)	0.026** (0.011)	0.023** (0.011)		0.846 (0.799)
Audited in round $r-8$	0.002 (0.014)	0.003 (0.014)		-0.330 (0.553)	0.043*** (0.013)	0.043*** (0.014)		1.316 (0.873)	0.024** (0.011)	0.024** (0.011)		1.382 (0.908)
Audited in round $r-9$	0.004 (0.014)	0.004 (0.014)		-1.046* (0.550)	0.022 (0.014)	0.022 (0.014)		-0.375 (0.849)	0.017 (0.011)	0.017 (0.011)		-0.422 (0.851)
Round 2	-0.009 (0.019)	-0.008 (0.019)		0.564 (0.698)	-0.006 (0.019)	-0.019 (0.019)		0.447 (1.015)	-0.011 (0.016)	-0.005 (0.016)		0.702 (0.996)
Round 3	-0.031 (0.019)	-0.033* (0.019)		0.525 (0.741)	-0.003 (0.019)	-0.021 (0.019)		-0.014 (1.055)	-0.022 (0.016)	-0.015 (0.016)		0.224 (1.027)

Variables	Non-salaried compliance				Salaried compliance				Overall compliance			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Round 4	-0.046** (0.019)	-0.050*** (0.019)		0.279 (0.732)	-0.0278 (0.019)	-0.044** (0.019)		-1.571 (1.004)	-0.040** (0.016)	-0.037** (0.016)		-0.805 (0.960)
Round 5	-0.085*** (0.019)	-0.087*** (0.019)		-0.937 (0.707)	-0.039** (0.019)	-0.059*** (0.019)		-3.102*** (1.064)	-0.071*** (0.016)	-0.064*** (0.016)		-2.581*** (1.000)
Round 6	-0.164*** (0.024)	-0.167*** (0.024)		2.819*** (0.878)	-0.0902*** (0.024)	-0.109*** (0.024)		-4.973*** (1.462)	-0.133*** (0.020)	-0.128*** (0.020)		-4.545*** (1.421)
Round 7	-0.156*** (0.024)	-0.161*** (0.024)		2.973*** (0.899)	-0.114*** (0.024)	-0.131*** (0.024)		-5.915*** (1.556)	-0.142*** (0.020)	-0.138*** (0.019)		-6.011*** (1.548)
Round 8	-0.173*** (0.024)	-0.176*** (0.024)		3.680*** (0.913)	-0.106*** (0.024)	-0.119*** (0.024)		-5.472*** (1.563)	-0.145*** (0.019)	-0.142*** (0.019)		-5.442*** (1.546)
Round 9	-0.182*** (0.024)	-0.184*** (0.024)		3.586*** (0.884)	-0.094*** (0.024)	-0.107*** (0.023)		-5.125*** (1.461)	-0.145*** (0.019)	-0.140*** (0.019)		-5.195*** (1.436)
Round 10	-0.167*** (0.024)	-0.171*** (0.024)		4.165*** (0.925)	-0.101*** (0.024)	-0.120*** (0.023)		-5.302*** (1.547)	-0.141*** (0.020)	-0.136*** (0.019)		-5.396*** (1.523)
Female	0.116* (0.060)	0.117* (0.060)	0.118** (0.058)	6.298*** (1.839)	0.093* (0.053)	0.093* (0.054)	0.091* (0.053)	7.959*** (2.292)	0.110** (0.053)	0.110** (0.053)	0.109** (0.051)	10.70*** (2.620)
Non-tax filer	0.030 (0.088)	0.028 (0.088)	0.026 (0.086)	0.627 (2.408)	0.066 (0.078)	0.059 (0.079)	0.062 (0.078)	-0.328 (3.401)	0.052 (0.076)	0.053 (0.078)	0.053 (0.076)	-1.688 (3.040)
Other demographic variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.497 (0.311)	0.301 (0.306)	0.286 (0.299)	7.179 (7.550)	0.225 (0.276)	0.262 (0.275)	0.257 (0.270)	7.049 (9.948)	0.478* (0.273)	0.266 (0.269)	0.263 (0.263)	14.23 (9.769)
Observations	1,831	1,831	1,840	1,761	1,824	1,824	1,833	1,465	1,831	1,831	1,840	1,471
Number of taxpayers	184	184	184	177	184	184	184	167	184	184	184	167
R-squared	0.36	035	0.33		0.31	0.29	0.28		0.38	0.37	0.35	
Wald chi2	1 308.87	1 287.50	964.70	163.93	627.10	593.51	439.29	149.27	1 404.90	1 364.76	1 003.13	149.27
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Log likelihood				-282.90				-163.77				-163.77
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1												

Source: Author's own calculations.

Findings from this study also showed that audit and penalty rates had a negative joint effect on both salaried and non-salaried compliance rates. This implied that taxpayers reduced their salaried and non-salaried compliance levels when subjected with a combination of higher audit and penalty rates. This finding is counter-intuitive relative to the treatment averages in the descriptive statistics. However, unlike regression analysis, descriptive statistics do not account for relevant individual controls. As such, treatment averages are suggestive results, and are not sufficient for drawing conclusions. In light of the foregoing discussion, the regression results showed that non-salaried income compliance rates declined by 0.07 percentage points, whilst salaried income compliance rates declined by 0.15 percentage points (when subjected with a combination of a 30 percent audit rate and 300 percent penalty rate), compared to when they were subjected to a combination of low audits and penalties.

The negative joint effect of higher audit and penalty rates on compliance rates can be attributed to a number of factors. For instance, taxpayers may construe a combination of higher audit and penalty rates as a confirmation by authorities that non-compliance is widespread, which is a sign of a lack of capacity and ability to enforce compliance. Such a perception motivates taxpayers to reduce their compliance levels (see Alm & Martinez, 2003: 150–151). Wahl *et al.*, (2010: 386) highlighted that taxpayers may construe an increase in the audits and penalty rates as a sign of distrust by the tax authority. As trust is inherently reciprocal in nature, taxpayers will in turn lose trust in the authority,

leading them to reduce their compliance levels; hence, the negative joint effect of higher audit and penalty rates on compliance (see also Gangl, Torgler, Kirchler & Hofmann, 2014; Mohdali, Isa & Yusoff, 2014).

This study also established that compliance declined as total income increased. The decline is, however, very small for both incomes. More specifically, an increase in the share of non-salaried income in total income by 1 percentage point led taxpayers to reduce their non-salaried income compliance level by 0.15 percentage points and, concomitantly, increased compliance in respect of salaried income by 0.20 percentage points.

Overall compliance declined by 0.23 percentage points, following a 1 percentage point increase in the ratio of non-salaried income to total income. This implied that the composition of income had a significant effect on compliance. These findings indicated that, as the share of non-salaried income increased, taxpayers tended to evade more on the hard-to-detect income (non-salaried income) at the expense of the easy-to-detect income (salaried income), implying that individual taxpayers were risk averse (as postulated by Becker (1968), Allingham & Sandmo (1972) and Yitzhaki (1974)). This finding seem to suggest that high net-worth non-salaried individuals had a higher non-compliance rate than those with lower income, which tend to suggest that high-net worth individuals may constitute the significant share of South Africa's PIT gap.

In addition to the parameters discussed above, this study investigated the effect of previous audits on compliance in subsequent periods. As pointed out by Alm *et al.* (2009), the traditional deterrence theory argues that previous tax periods do not influence subsequent periods, suggesting that tax periods are independent of each other. Contrary to this notion, this study found that taxpayers increased their compliance levels in the first two rounds (subsequent to the round in which they were audited). However, the increase in compliance rates declined in each passing round. More specifically, taxpayers respectively increased their non-salaried compliance rate by 0.13 and 0.03 percentage points in the first and second rounds (subsequent to the round in which they were audited). In the same vein, taxpayers increased their salaried income compliance rate by 0.11 and 0.03 percentage points in the first and second rounds, respectively, subsequent to the round in which they are audited. These findings suggested that taxpayers, in anticipation of future audits, increased their compliance levels in periods subsequent to the period in which they were audited. The results are in line with the assertion by Alm *et al.*, (2009) that there is a possibility that individuals' current actions (behaviour) can be influenced by their past experiences. From these findings, the study did not reject the hypothesis that an audit in the previous tax year influences taxpayers to increase their compliance rates in the subsequent year.

Considering that the experimental setting for this study was context-rich (used explicit tax terms), it was possible that subjects who had been involved in tax filing before produced different cognitive responses from those of non-tax filers. Participants' filing experiences had therefore been controlled

for in the regression model. However, the results showed no significant differences in compliance levels between these two groups of participants. This finding confirmed 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.

The results of this study also found that female taxpayers complied more than males. This finding was contrary to Richardson (2006), who suggested that gender had no significant impact on compliance. A higher compliance rate by the females confirmed the findings of Engida & Baisa (2014), who found that women were more honest than men. These findings may also suggest that women were more risk averse than men. Other demographic variables that were controlled for included age, ethnicity, religion, work experiences, academic discipline and level, family annual income level and marital status. However, these control variables were found to be largely insignificant in explaining the differences between individuals' compliance levels.

Round effects were also controlled for. The results showed that subjects' compliance rates for rounds one, two and three were not significantly different from each other. However, taxpayers significantly increased their non-compliance from Round Three through to Round Ten. One of the reasons behind this trend could be that subjects reduced their compliance levels as they got 'used' to the experiment.

As depicted in Table 5.7, findings from this study showed that, in general, salaried and provisional taxpayers responded the same to the traditional enforcement mechanisms. However, these measures had a larger impact on provisional taxpayers.

5.7   CONCLUSION AND POLICY IMPLICATIONS

Results from this study indicated that individual taxpayers evaded more on non-salaried than on salaried income. The study also found that there was a positive relationship between the audit rate and compliance. Similarly, taxpayers increased compliance when subjected to higher penalty rates. These findings seemed to confirm the propositions of the economics-of-crime theory (see Becker, 1968).

However, this study also found that taxpayers reduced their compliance levels when subjected to a combination of higher audit and penalty rates.

The traditional deterrence theory argues that previous tax periods do not influence subsequent periods, suggesting that tax periods are independent of each other. Contrary to this notion, this study found that taxpayers increased their compliance levels in the period(s) subsequent to the one in which they are audited. The study provided some evidence that compliance declined as the taxpayer's total income increased. The results also showed that taxpayers increased (reduced) their compliance on salaried income (non-salaried income), as the ratio of non-salaried income to total income increased. It has also been found that female taxpayers complied more than male taxpayers do.

The findings discussed above have some implications for both tax policy and tax administration. Firstly, audits and penalties are effective compliance-enhancement mechanisms, although audits are more effective than penalties. Considering that taxpayers increase compliance in subsequent periods to the one in which they are audited, it is imperative that the tax authority increase its audit sample, in addition to increasing the frequency of audits. The audit mechanism has to be comprehensive enough to make it difficult for holders of the 'hard-to-detect income' to evade. However, considering that audits are a costly enforcement mechanism, it is imperative for the tax authority to ensure that the costs of carrying out an audit are less than the amount of evaded taxes.

Despite the fact that audits and penalties are powerful instruments to stimulate compliance, these measures should be applied with some caution. For instance, taxpayers may interpret threats of a combination of high audits and penalties as a confirmation by authorities that non-compliance is widespread, which would mean that the authorities lack the capacity and ability to detect it. As highlighted by Alm & Martinez (2003), such a perception by taxpayers reduces their intrinsic motivation to comply, resulting in a decline in voluntary compliance. More so, the decline in compliance rates following an increase in both audits and penalty rates confirms the proposition of the slippery model by Kirchler, Hoelzl & Wahl (2008) that excessive enforcement reduces taxpayers' intrinsic motivation to comply, hence reducing voluntary compliance.

Considering that there is a negative relationship between compliance and the share of non-salaried income to total income, it is imperative that the authority pays more attention to high-net worth self-reporting taxpayers.

Lastly, it is recommended that the authority pay more attention to male taxpayers, as they exhibit higher levels of non-compliance than their female counterparts.

CHAPTER 6

TAXPAYER BEHAVIOUR AND VOLUNTARY DISCLOSURE PROGRAMMES

6.1   INTRODUCTION

To improve tax compliance, many governments across the world continue to come up with 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, tax reprieves have been a common compliance-enhancement instrument over the past years, more particularly across Africa (see Section 6.4). 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-Laborda & Rodrigo, 2003: 74).

There are two forms of tax reprieves: an amnesty and a 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 as 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, the effects of tax reprieves on compliance are mixed. For instance, some (e.g. Leonard & Zeckhauser, 1987; Fisher, Goddeeris & Young, 1989; Torgler, 2003) argued that reprieves motivated delinquent taxpayers to increase their compliance in future, as it would no longer be necessary to evade 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 constituted a psychological loss. Torgler & Schaltegger (2005: 416) pointed out that 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-Laborda & Rodrigo, 2003; Alm, Martinez & Wallace, 2009) pointed out that reprieves were of no material effect on compliance.

In light of the foregoing discussion, it is evident that the efficacy of tax reprieves is debatable. In spite of this, tax reprieves (both temporary and permanent) have been common compliance-enhancement instruments in South Africa (see Section 2.4.3). However, existing evidence on the efficacy of tax reprieves is based largely on temporary amnesties drawn from developed-country applications. There is, therefore, limited evidence on the efficacy of tax reprieves on compliance from a developing-country perspective. Further, existing literature focused on the effect of reprieves on the 'overall compliance' (i.e. an aggregated compliance rate for salaried and non-salaried individual taxpayers). It would be more informative if the effect of reprieves were examined on a disaggregated compliance rate. It is against this backdrop that this chapter 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. Considering that South Africa's PIT gap is largely constituted of non-salaried income taxpayers (see Section 3.6.3), this empirical exercise will inform the tax policy on how reprieves can best be structured to effectively reduce the country's tax gap.

The rest of this chapter is structured as follows: Section 6.2 discusses the theoretical arguments on tax reprieves. Section 6.3 discusses findings from existing literature on the efficacy of tax reprieves. Section 6.4 provides an overview on how tax reprieves have been applied in some African countries. Section 6.5 discusses the methodological approach that was used in this study. Section 6.6 outlines the results of the study, Section 6.7 provides the discussion of the findings and the policy implications, and Section 6.8 concludes.

6.2   THEORETICAL CONSIDERATIONS

Taxpayer behaviour can be examined under two different frameworks: the economic deterrence and the behavioural theories. As previously discussed (in Section 5.2), the economic deterrence approach to tax evasion posits that taxpayers are utility maximisers, whose decision to pay tax is arrived at after evaluating the benefits and costs of evading. The potential benefits of evasion are primarily the amount of unpaid taxes. Costs are the penalties that the taxpayer suffers when unpaid taxes are successfully detected. Essentially, the economics-of-crime approach posits that taxpayers' compliance decisions are influenced solely by financial considerations.

The economic deterrence model is credited for providing fundamental insight on what drives tax compliance. However, Alm & Martinez-Vazquez (2001), Alm & Torgler (2011) and Weber, Fooken & Herrmann (2014) argued that compliance cannot be explained solely by financial considerations arising from the level of enforcement. Alm & Torgler (2011) pointed out that the proportion of tax returns that is thoroughly audited are quite small in most countries and, at the same time, penalties imposed on defaulters were generally low. Under such circumstances, the standard economic approach to tax evasion predicts for higher levels of evasion, as taxpayers are highly unlikely to be detected and penalised. However, there is some evidence that compliance levels were generally higher than what the standard economic analysis predicted. For instance, Erard & Feinstein (1994)

and Andreoni, Erard & Feinstein (1998) established that people may choose to report their income truthfully, even in cases of low audit and penalty rates. It is therefore suggested that the deterrent approach could be improved by incorporating non-economic factors in the standard deterrence model. The incorporation of non-economic factors in the study of tax evasion constitutes the behavioural theory, which is loosely defined as the application of methods or evidence from other social science disciplines to understand individual and group decision making (Alm, Martinez-Vasquez & Torgler, 2010; Weber *et al.*, 2014Alm & Sheffrin, 2016).

The non-economic factors that influence taxpayers' compliance behaviour include moral sentiments 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. Psychological losses therefore constitute the costs of evasion. As such, taxpayers may need to comply with the tax requirements to avoid these losses. 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 back 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).

6.2.1   The effect of a tax reprieve on compliance: theoretical modelling

Based on Alm & Martinez (2003) and Torgler & Schaltegger (2005), the following is an illustration of how a tax reprieve may influence tax compliance. 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 (α), which is calculated as a multiple of unpaid taxes.

Thus:

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

$$I_{ua} = Y_i - tX_i \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (19)$$

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

$$I_a = Y_i - tX_i - \alpha[t(Y_i - X_i)] \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.. (20)$$

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:

$$EV_i = Y_i - tX_i - p\alpha[t(Y_i - X_i)] \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots. (21)$$

Maximising equation (21) with respect to the reported income (*X*) shows that the taxpayer optimally declares all the income if:

$$p\alpha > 1 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots... (22)$$

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 (21) as follows:

$$EV_i = Y_i - tX_i - p\alpha[t(Y_i - X_i)] - \phi t(Y_i - X_i) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (23)$$

Equation (23) 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, ϕ can be interpreted as a measure of the amount of taxes that one has to pay to circumvent psychological loss. Alternatively, ϕ may be interpreted to measure the taxpayer's willingness to pay taxes.

The inclusion of a reprieve into equation (21) transforms conditionality (22) to:

$$p\alpha + \phi > 1 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.. (24)$$

Concisely, conditions (22) and (24) 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 (ϕ), to avoid some psychological losses.

6.2.2   Benefits and costs of tax reprieves

In light of the foregoing discussion, a tax reprieve may have a number of benefits. Firstly, a reprieve may convince taxpayers that tax evasion is morally wrong, which may stimulate their intrinsic motivation to increase future compliance. Secondly, it is possible that some taxpayers evade unintentionally. Such a group of taxpayers may want to rectify their tax status. They may, however, fail to correct their delinquency in fear of being penalised and embarrassed. A reprieve can therefore provide such a group with an opportunity to enter the tax net voluntarily and without any fear of being punished (Fisher *et al.*, 1989; Torgler, Schaltegger, Christoph & Svaffner, 2003).

Thirdly, by removing the danger that taxpayers would be punished for past delinquencies (if they disclosed them), delinquent taxpayers would enter the tax net voluntarily, thereby widening the tax base. Furthermore, the government would be able to raise immediate revenue at reduced administrative costs, such as audits, litigations and criminal proceedings (Torgler & Schaltegger, 2005: 405).

Last (and perhaps most imperative), reprieves can serve a smooth transition to a more stringent enforcement regime. Leonard & Zeckhauser (1987: 65) suggested that, when the law has not been enforced for a long time, the public would implicitly regard non-compliance as a minor offence. It would seem unfair to migrate towards a stricter enforcement regime without providing offenders with 'sufficient' warning. A reprieve can therefore grant delinquents with opportunity to rectify their tax affairs before migrating into the new enforcement regime.

Notwithstanding the afore-discussed potential benefits of tax reprieves, there are arguments that suggest that tax reprieves might not be an effective compliance enhancement strategy. For instance, Leonard & Zeckhauser (1987) and Bayer, Oberhofer & Winner (2014) suggested that honest taxpayers may regard a reprieve as an unfair reward for non-compliance. Such a perception by honest taxpayers may reduce their intrinsic willingness to pay taxes in future. Further, Torgler et al. (2003) suggested that the introduction of a reprieve can be interpreted to mean that evasion is a minor offence and is forgivable. This erodes taxpayers' psychological costs (such as guilt and shame) associated with evasion. A reduction in psychological costs reduces taxpayers' morale, which would trigger a reduction in compliance levels.

A tax reprieve can also be regarded as an indication that authorities lack enforcement prowess to detect and punish those who evade. Under such circumstances, evaders might increase their non-compliance whilst honest taxpayers might be tempted to start evading (see Alm & Beck, 1991; Luitel & Sobel, 2007). Torgler & Schaltegger (2005: 406) suggested that a reprieve may introduce an anticipatory behaviour among taxpayers so that, after a reprieve window, taxpayers may anticipate more reprieves in future. There would be no incentive to comply if there was an imminent reprieve.

Thus, the anticipatory behaviour might encourage taxpayers to reduce their tax loyalty. From this argument, it can also be concluded that a permanent type of reprieve may reduce taxpayers' intrinsic motivation to comply, as there would be no incentive to report the previously unreported income (as the reprieve would be open-ended). The pros and cons of a tax reprieve are summarised in Table 6.1.

Table 6.1: Benefits and costs of a tax reprieve

Arguments for a tax reprieve
Generates additional public revenue in the short-run;   Widens the tax base;   Brings tax defaulters back into the tax system (which enhances future control of evasion);   Provides a 'soft option' to those who became defaulters unintentionally;   Can be viewed as a signal that the authorities are committed towards fighting tax evasion;   Increases future compliance by lowering its costs (no longer necessary to evade to hide past bad behaviour);   Reduces administrative costs;   Improves compliance, as authorities will be able to monitor taxpayers who were previously outside the tax system; and   Provides politically feasible transition to a more stringent enforcement regime.
Arguments against a tax reprieve
Undermines tax morale, as honest taxpayers may feel upset;   May be viewed as signal that the government is weak, and is unable to enforce compliance;   May cause taxpayers to anticipate more reprieves, which may reduce compliance in the long run;   Signalises that evasion is minor offence;   Informs taxpayers of the presence of tax evasion;   Reduces moral costs to behave honestly; and   Generates revenue that would have been collected without a reprieve.

Source: Leonard & Zeckhauser, 1987; Fisher *et al.*, 1989; Alm & Beck, 1991; Andreoni, 1991); Torgler *et al.*, 2003; Bayer *et al.*, 2014**.**

6.3   EMPIRICAL EVIDENCE: THE EFFICACY OF TAX REPRIEVES

Research on the nexus between tax reprieves and compliance is expanding, and findings from these studies are mixed. They are broadly drawn from two estimation techniques: time-series analysis and experimental and survey methods.

6.3.1   Time-series analysis

To investigate the effect of an amnesty on tax compliance, Luitel & Sobel (2007) employed a panel regression analysis using quarterly data on tax revenue for certain U.S. states over the period 1980-2004. The study was confined to those states with standard income tax and general sales tax. Their findings showed that a first-time tax amnesty increased revenue in the short-term, which was followed by long-term revenue losses. The authors attributed the emergence of losses to a decline in future voluntary compliance. The study also established that any subsequent amnesties did not

produce significant short-term revenue; instead, they generated revenue losses, of which the magnitude increased with each amnesty. This suggested that subsequent amnesties reduced taxpayers' motivation to comply, as taxpayers may regard repeated amnesties as a sign of the authorities' lack of dexterity to detect non-compliance. Taxpayers may construe repeated amnesties as implying that non-compliance is a petty offence, which may reduce their morale to comply with the tax requirements. Luitel & Sobel (2007) concluded that an amnesty is associated with long-term losses, whose present value could surpass the immediate gains. As such, Luitel & Sobel (2007: 21) recommended that an amnesty should not be introduced repeatedly. For a wide understanding on the efficacy of reprieves, it would be important if such a study could be expanded to include a permanent reprieve.

Alm & Beck (1993) employed several time series models[36] to investigate the efficacy of an amnesty introduced in Colorado in 1985. Using monthly data on PIT revenues for the period 1980-1989, results from all models strongly indicated 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. That is, an amnesty seems unlikely to aid compliance, both in the short- and long-term, 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). The authors suggested that, because of its short lifespan, the reprieve had no effect on taxpayers' compliance decisions. The authors further suggested that, as the amnesty was accompanied by stricter enforcement efforts, it was likely that any compliance-reducing effects of the amnesty itself were offset by the compliance-enhancing effects from higher enforcement efforts.

López-Laborda & Rodrigo (2003) used an Autoregressive Integrated Moving Average (ARIMA) regression analysis to detect the long-term effects on compliance arising from the Spanish tax amnesty of 1991. Using tax revenue data for the period 1979-1998, they found that the amnesty had no effect on subsequent compliance, both in the short- and long-term. These results confirmed the findings of Alm & Beck (1993), that an amnesty had no demonstrable effect on compliance. However, these findings were based on total collections of all the taxes covered by the reprieve, which was susceptible to concealing some important information. It would therefore be important to replicate the study using disaggregated tax collections to establish the effect of the reprieve on each tax head covered by the reprieve.

Alm, Martinez & Wallace (2009) employed a range of structural and time series analyses to examine the effect of several tax amnesties introduced by Russia in the 1990s. Using monthly data on tax

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[36] The models used include the simple ordinary least squares time trend models, univariate time series models and multivariate time series models (Alm & Beck, 1993: 54).

collection for the major tax heads[37] for the period 1992-2004, the study established that Russian tax amnesties had no demonstrable impact on revenue, both in the short- and long-term. These results indicated that an amnesty was unlikely to be a fiscal solution, nor a fiscal harm. Alm *et al.* (2009: 249) argued that amnesties were 'fiscal gimmicks', which should be avoided. It is important to note that the study focused on the impact of amnesties on total revenue. It would be more enlightening if the amnesty's causal effects on compliance were established for the different tax heads that were covered by the reprieve.

6.3.2   Experimental and survey methods

Alm, McKee & Beck (1990) conducted a laboratory experiment to explore the long-term effect of a tax amnesty on compliance in the US. The experiment was conducted with student subjects at the University of Colorado. The experimental setting captured the fundamental elements of voluntary reporting in the US. Subjects received some income, which was supposed to be reported to a tax authority for tax purposes. They paid taxes on income that was reported voluntarily. The authority would conduct some audits, and the subject would pay a fine on unpaid taxes if caught cheating. Subjects were randomly assigned to sessions (groups), where they were exposed to amnesties, which bore different features. In one session, the amnesty was introduced with no advance warning. In other sessions, subjects were informed at the beginning that they might encounter an amnesty in one of the rounds. The study established that compliance declined after an amnesty, especially for those who were at least moderately compliant prior to the reprieve window. This finding seemed to confirm the notion that honest taxpayers regard an amnesty as an unfair reward for non-compliance, a perception that reduced their willingness to comply. Alm *et al.* (1990) further established that compliance increased if post-amnesty enforcement efforts increased. These findings were in contrast with those by Alm & Beck (1993), López-Laborda & Rodrigo (2003) and Alm *et al.* (2009). Although the findings from this study seemed plausible, it would be essential to expand the study by investigating the efficacy of a permanent reprieve.

Torgler *et al.* (2003) conducted laboratory experiments in Switzerland and Costa Rica, to investigate the effect of a tax amnesty on compliance. The study further investigated how the possibility of voting for an amnesty affected compliance in the long-run. Subjects were given an opportunity to vote for, or against, the introduction of an amnesty. However, before they voted, subjects were allowed to share their views about the amnesty. The study established that, when people were given an opportunity to vote for its introduction, an amnesty significantly increased tax compliance. The authors therefore suggested that the voting procedure, particularly discussions that were held prior to voting, brought about a sense of civic duty: taxpayers became aware of the importance of the taxes in the provision of public goods and services. Relatedly, Torgler & Schaltegger (2005) conducted laboratory experiments in Switzerland and Costa Rica, to examine whether taxpayers'

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[37] These included VAT, CIT, PIT and excise taxes.

involvement in the crafting of an amnesty policy affected compliance. As in Torgler *et al.* (2003), they found that voting for a tax amnesty had a positive effect on compliance.

Saraçoğlu & Lu (2011) examined the role of a tax amnesty on compliance in Turkey. The study used data collected from face-to-face interviews and established that amnesties may trigger taxpayers to anticipate another future reprieve. This anticipatory behaviour reduced taxpayers' intrinsic motivation to comply, which dampened future compliance. The study also suggested that an amnesty that was accompanied by weak enforcement of the tax law did not produce significant improvement in compliance. Furthermore, in support of Alm *et al.* (1990), the study found that compliance increased if 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. To maintain taxpayers' confidence in the tax authorities, it was suggested that amnesties be incorporated in tax legislation, which should be enforced in terms of the letter and spirit thereof.

In view of the foregoing discussion, it is evident that tax reprieves have (over the years) been a common enforcement strategy across many countries. However, empirical evidence on the efficacy of tax reprieves are diverse. The existing evidence is, however, based on temporary reprieves and is largely drawn from developed country applications. The efficacy of tax reprieves, more especially in developing countries, remains an unresolved question.

6.4   TAX REPRIEVE EXPERIENCES IN AFRICA

Over the past years, there has been a proliferation of tax reprieves across many developing countries, particularly also in Africa. However, the typology of these reprieves vary from country to country. In view of this, this section provides a brief overview on how the reprieves are implemented in South Africa and other comparable countries.

Namibia

The Namibian government introduced the Tax Arrears Recovery Incentive Programme, a reprieve whereby tax defaulters were allowed to disclose their unreported income voluntarily and pay the outstanding taxes (Ministry of Finance, 2018). The reprieve ran for six months (from 1 February 2017 to 31 July 2017) and covered all taxes that are under the administration of the Inland Revenue Department. Participants in the programme were exempted from paying all penalties imposed for late submission of tax returns and the late payment of taxes, and were exempted from paying 70 percent of the interest liability. By the end of July 2017, N$243 million ($19.5 million) worth of taxes had been collected (as a result of the reprieve), which was six percent of the N$4 billion ($320 million) owed to the state in taxes (Ministry of Finance, 2018)[38]. Following the low success rate of the

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[38] The amounts are in nominal values.

programme, the reprieve was extended for another six months, from 11 September to 11 March 2018 (Ministry of Finance, 2017).

Zimbabwe

To lure tax delinquents into clearing their tax arrears, the Zimbabwean government introduced a tax reprieve in 2014 (precluding the imposition of administrative, civil or any other penalties) to taxpayers who voluntarily disclosed their unpaid taxes (ZIMRA, 2018b). However, defaulters were still required to pay the principal amount of the tax due. The reprieve covered all taxes under the administration of the Zimbabwe Revenue Authority (ZIMRA). This included income tax, VAT, capital gains tax, customs and excise duties and stamp duties. Thus, the programme also covered any outstanding taxes or duties due to non- or under-declaration of sales or capital gains and non-payment of duty on imported goods. The programme ran from 1 October 2014 to 31 March 2015. However, the relief period was extended by three months to 30 June 2015 (ZIMRA, 2018c). As a result of the reprieve, a total of $40 million was collected, which is four percent of the $1 billion owed to the state in taxes (Majaka, 2016). The government reintroduced the reprieve in 2018, running for six months, from 1 January 2018 to 30 June 2018.

Zambia

To encourage taxpayers to clear their tax debts, the Zambian government introduced a reprieve on interests and penalties to those who voluntarily reported their previously undeclared incomes (ZRA, 2017: 1). The reprieve ran for three months from 24 April 2017 to 31 July 2017, and covered all taxes under the administration of the Zambia Revenue Authority, save for customs duty and property tax. Defaulters were not eligible to apply for the relief if they were aware of a pending audit or investigation on the income for which the relief was being sought. Resultantly, the government recovered ZK384 million ($39.2 million) in tax arrears. To allow tax defaulters more time to comply, the reprieve was extended by 30 days to 31 August 2017. Defaulters who failed to take advantage of the moratorium were assured of stiffer penalties after the reprieve. To this effect, the government bought 40 new vehicles and hired additional staff to step up its enforcement strategies post the reprieve (ZBT, 2017). However, information on how much was raised from this last reprieve is not publicly accessible.

Kenya

In 2015, the Kenyan government introduced a tax amnesty for individual property owners on their past undeclared rental income. Those who declared their previously undeclared incomes were exempted from paying the tax owed, the penalty and interest levied on the outstanding tax (KRA, 2015). The amnesty covered a period of 12 months, from 1 July 2015 to 30 June 2016. In 2017, the government introduced another amnesty, whereby residents with undeclared income held offshore were allowed to voluntarily declare their past delinquencies and be spared from paying the tax owed, along with any penalties and interest on unpaid taxes (KRA, 2017). The reprieve ran for 12 months,

from 1 January 2017 to 31 December 2017. However, the amount of revenue raised from these reprieves is not publicly available.

Nigeria

To improve compliance, the Nigerian government introduced a VDP, providing tax defaulters with an opportunity to voluntarily disclose their past non-declared income and pay the tax owed, at no penalty (Adesina, 2018). The reprieve covered all state and federal taxes, including income tax, capital gains tax and VAT, amongst others. The relief window lasted for nine months, from 1 July 2017 to 31 March 2018. In the first six months of the reprieve window, approximately $47 million was collected through the scheme, which is 0.047 percent of the $1 billion target (Okechukwu, 2017). The scheme was later extended by two months to 30 June 2018 (Adesina, 2018), and taxpayers were informed of an increase in enforcement measures after the reprieve. Those who failed to take advantage of the moratorium were to be severely punished.

South Africa

As discussed in Section 2.4.3, the South African government instituted a series of reprieves over the last few years, 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[39] to further encourage voluntary compliance and broaden the tax base. The move to shift from amnesties to VDPs was necessitated by the need to improve revenue, as delinquent taxpayers would be required to repay the tax owed in the VDP regime. 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

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[39] See Section 2.4.3 for the distinction between a VDP and an amnesty.

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 (see Section 2.4.3).

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 (see Section 2.4.3). 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 CRS). It was, therefore, a special warning to offshore income-holders that the era of banking secrecy in tax matters was ending, as tax authorities were going to gather information from financial intermediaries and share these with other tax authorities across the globe. Thus, the adoption of the CRS 'necessitated' the introduction of the SVDP, alongside the already existing permanent VDP (SARS, 2016b: 3). By 08 March 2018, the government had collected over R2.7 billion ($200 million) in tax arrears, under the SVDP (SARS, 2018).

In light of the foregoing discussion, it is evident that the tax reprieves are a common tax enforcement instrument in many countries (including those in 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[40]. 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

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[40] Short-term refers to the period in which the policy is introduced, whereas long-term refers to the period after the policy intervention.

study may inform the authorities on how best to design and implement VDPs, which will improve compliance.

6.5 METHODOLOGICAL APPROACH

This study employed a controlled laboratory experiment to investigate the immediate (short-term) and future (long-term) effects of VDPs on compliance. Considering that tax evasion is an offence, delinquents would hide their actions to avoid the punishment associated with non-compliance (if detected). As such, it is difficult to observe evasion in a naturally occurring world. A laboratory experiment provides an investigator with a better opportunity to generate reliable data on compliance behaviour, as factors suggested by theory are tested individually and independently in a simplified controlled environment (see Section 4.1).

The experiment was conducted at Stellenbosch University with students who do not have prior exposure to laboratory experiments. Subjects were drawn from different disciplines and were recruited via electronic invitations. Using student subjects is a common practice in the empirical literature on tax evasion (see e.g. Park & Hyun, 2003; Torgler & Schaltegger, 2005; Wahl, Kastlunger & Kirchler, 2010; Alm, Bernasconi, Laury, Lee & Wallace, 2016; Asnawi, 2016). Technically, students are the standard subjects for a conventional laboratory experiment (see Section 4.2). There is now vast evidence that shows no significant differences in behavioural responses between student and non-student subjects (see Plott, 1987; Alm & Jacobson, 2007; Alm, Martinez-Vasquez & Torgler, 2010; Alm, Bloomquist & McKee, 2013; Alm et al., 2015; Choo, Myles & Fonseca, 2014).

6.5.1 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 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. Importantly, subjects were informed that they would keep their after-tax income at the end of the experiment.

Taxes were paid on reported income at a fixed rate of 30 percent. Although 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, 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. As is the case in Section 5.5.1, the 50 percent detection rate is hypothetical.

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 no personal identification would be collected, implying that their responses were anonymous.

The experimental exercise was context-rich (i.e. it employed explicit tax terms). 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, thus making it possible to extrapolate the finding from the experiment to the real world. In other words, the contextualisation of the experiment setting provided for the necessary extent of parallelism to the real world, which is key when it comes to the external validity of experimental results (Torgler, Schaffner & Macintyre, 2009: 11).

Subjects were paid their earnings in cash at the end of the experiment. However, contrary to the previous experiment (in Section 5.5.1) where subjects were paid from only one round, earnings for the participants in this experiment were drawn from all rounds. As a cost cutting measure on the part of the investigator, the earnings were converted from laboratory currency (lab Rands) to South African currency (Rands) at the rate of lab R12 = R1. The need to draw earnings from all rounds was necessitated by the fact that the experimental setting permitted participants to report on more than one round (i.e. current plus up to three previous rounds. As such, drawing payments from only round

(as was the case in the previous) experiment could likely distort the experimental setting. Importantly, subjects were provided with instruction sheets that explained how the earnings were determined. The instruction sheets are depicted in Appendix E[41]. Furthermore, as was the case in Chapter 5, 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.

6.5.2   Experimental sessions

The experiment comprised of five sessions of 12 rounds each. Subjects were limited to only one session. Treatments were varied across and within sessions. Thus, the study employed a combination of a between- and within-subject experimental design (refer to Section 4.5.2). Within sessions, the treatment was introduced in Round Seven. This was to ensure that behavioural differences were controlled by letting each subject be their own control. At the same time, treatments were varied across sessions for comparison of behaviour of subjects across treatments. Thus, each session can be a 'control' for the other.

In Session One (the control session), no VDP 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 by 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. Parameters for the experiment are summarised in Table 6.2.

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[41] The instruction sheets were developed from the one used by Alm *et al.* (2016).

Table 6.2: 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

Source: Author's own calculations.

In sum, as was the case in Section 5.5.1, the experiment used the same parameters in the baseline period (i.e. Rounds One to Six) across all sessions to ensure that behavioural differences were controlled by allowing each subject to be their own control. Across all sessions, policy interventions (treatments) were introduced after Round Seven. This was to ensure that the behaviour of the subjects were comparable across treatments by making each session a 'control' for the other. Thus, the experiment used a combination of the within- subject and between subject experimental designs, which is necessary in improve the statistical power of the experimental data. This approach is necessary to reduce the impact of order effects resulting from a within-subject experimental design (refer to Section 4.5.2).

6.5.3   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 are 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 are 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).

6.5.4   Behavioural hypotheses

The experimental setting discussed above allows for the investigation of the effect of a VDP on compliance. It allows for the testing of a number of behavioural hypotheses drawn from empirical studies (previously discussed in Section 6.2.2):

- Hypothesis 1: A once-off VDP without increased enforcement measures reduces compliance:

The rationale for this hypothesis is that a VDP may cause taxpayers to anticipate more reprieves, which may reduce compliance in the long term. Further, honest taxpayers may regard the reprieve as an unfair reward for non-compliance, which may undermine their morale and induce them to start evading as well.

- Hypothesis 2: A once-off VDP with increased enforcement efforts increases compliance in the long-term:

This hypothesis is built on the understanding that taxpayers may regard a reprieve that is accompanied with increased enforcement as a signal that the authority expects everyone to comply and that delinquents who fail to rectify their status will be detected and penalised. This increases taxpayers' intrinsic motivation to comply and, hence, increases future compliance.

- Hypothesis 3: A permanent VDP without increased enforcement measures reduces compliance:

The rationale for this hypothesis is that taxpayers may perceive a permanent reprieve as a sign of incompetence or lack of political will by the authority to enforce compliance. Such a perception reduces taxpayers' willingness to comply and, hence, a decline in future compliance. Further, people may construe a permanent VDP to imply that evasion is a petty offence, which tends to reduce the moral costs to comply.

- Hypothesis 4: A permanent VDP with increased enforcement efforts increases compliance in the long-term:

This hypothesis is based on the notion that taxpayers may regard an increase in enforcement as a sign that the government is committed to reduce evasion, which may increase their morale to comply. An increase in enforcement may increase the moral costs to behave honestly and, hence, motivating defaulters to make use of the VDP to rectify their tax affairs.

6.5.5   Analytical approach

To establish the specific causal relationships between a VDP and taxpayers' compliance behaviour, this study employed a difference-in-difference (DID) approach. The DID is a quasi-experimental design that makes use of longitudinal data[42] from treatment and control groups, to obtain an appropriate counterfactual to estimate a causal effect (Bertrand, Duflo & Mullainathan, 2004; Angrist & Pischke, 2008). The effect of the intervention is estimated by comparing the difference in outcomes after and before the treatment for the population affected by the intervention, to the same difference for the unaffected population (control group). The DID estimation technique is credited for its simplicity, as well as its potential to circumvent many of the endogeneity problems that typically arise when making comparisons between heterogeneous individuals (Bertrand *et al.*, 2004: 250). Further, considering experimental treatments in this study were introduced in the same round (Round Seven) of every session, it is simple to control for the treatment variables in a DID model, as compared to other models. For instance, in a panel regression, the treatment variables tend to take the same numerical definition, which is 'meaningless'. It is against this backdrop that the study uses a DID estimation model to examine the effect of VDPs on compliance.

The primary empirical model for this study is specified as follows:

$$C_{ist} = \beta_0 + \beta_1 dT + \beta_2 dR + \varphi dT * dR + \beta_4 Z_{ist} + \varepsilon_{ist} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(25)$$

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: *treatVDPonce* (for the once-off VDP without increased enforcement efforts), *treatVDP_Audit* (for the once-off VDP with increased enforcement

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[42] Data containing observations of multiple phenomena obtained over several periods for the same individuals.

efforts), *treatVDPperm* (for the permanent VDP without increased enforcement efforts, and *treatVDPperm_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

- φ 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[43] 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 φ is defined as follows:

$$\hat{\varphi} = \left(\bar{C}^{Treatment}_{7-12} - \bar{C}^{Control}_{7-12}\right) - \left(\bar{C}^{Treatment}_{1-6} - \bar{C}^{Control}_{1-6}\right)\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(26)$$

Where the subscripts denotes time (rounds).

For robustness checks, a variety of regression specifications are employed, 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. These variables seem to play the significant role in influencing compliance behaviour. As such, it is necessary to examine the significance of the variables of interest (VDPs) in explaining compliance, without controlling 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. As previously discussed in Section 5.6.3, in regression analyses compliance can also be defined as a binary variable that takes the value of 1 (if the subject fully complies) and 0 (if otherwise). Thus, it is possible to employ a binary regression model (e.g. logistic and probit models) to validate findings from the primary regression model. Considering that results from logistic and probit models are generally similar (Park, 2010; Torres-reyna, 2017), this study employed a logistic model as its third model specification (Model 3).

6.6   RESULTS

The experiment was conducted with a panel of 200 subjects. The sample constituted 66.5 percent undergraduates (excluding first years) and 33.5 percent post-graduates. Of the population sample, 55 percent were male. The average age of the participants was 22 years. The racial composition for the population sample was as follows: 48 percent white, 33 percent black, 11 percent coloured and

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[43] In this study, short-term refers to the period in which the treatment is introduced.

8 percent other races. Of the total subjects, 14 percent were Catholics, 19 percent Protestants, 7 percent Baptists while 18 percent had no religion. 27 percent of the participants had filed a tax return before. Each subject participated in only one session (where each session constituted 12 rounds). Importantly, 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.

6.6.1   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 6.3. In Session One (the control group), the average compliance rate was 40 percent. In Session Two, subjects were given a once-off opportunity to rectify their past delinquencies at no penalty. The average compliance for Session Two was 60 percent, which was higher than the average compliance rate obtained from Session One. A relatively higher compliance rate seemed to suggest that taxpayers increased their compliance levels when subjected to a once-off VDP.

In Session Three, subjects were provided with a once-off VDP that was accompanied by a higher audit rate. The average compliance rate in this session was 61 percent. The average compliance rate obtained from Session Three was relatively higher than that of the baseline sessions, suggesting that taxpayers increased 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 suggested that a once-off VDP was more effective when augmented with increased enforcement measures.

Table 6.3: 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: Author's own calculations.

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In Session Four, subjects were offered a permanent VDP without increased enforcement measures. The average compliance rate for this session was 41 percent, which was slightly higher than that of the baseline session. The marginal difference in the average compliance rates between Sessions One and Two may suggest that a permanent VDP without increased enforcement efforts does not have much effect on compliance.

In Session Five, subjects were subjected to a permanent VDP that was complemented by a higher audit rate. The average compliance rate in this session was 56 percent, 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. More specifically, although the compliance rates for Sessions Four and Five were higher than that of Session One, these compliance rates were below those in Sessions Two and Three. These results seemed to suggest that permanent VDPs were less effective than once-off VDPs in enhancing compliance levels.

6.6.2   Regression results

The DID was employed to establish the specific causal inferences between the different types of VDP and taxpayers' compliance behaviour. As previously discussed in Section 6.5.5, a variety of regression specifications were conducted (Models 1 to 3), for robustness checks, whereby explanatory variables were included in the model on an incremental basis. Inferences were drawn from a model with the highest R^2, which is Model 2.

The regression results are depicted in Table 6.4 and are mostly robust across all model specifications. The results showed a positive but statistically insignificant coefficient of *treatVDPonce*round$_7$*, implying that a once-off VDP without increased enforcement measures had 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*rounds$_{8-12}$*, implying that a once-off VDP without increased enforcement efforts had no effect on compliance in the long-term. In summary, these results showed that a once-off VDP without increased enforcement measures was unlikely to generate immediate revenue, nor reduce future compliance.

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 showed that a once-off VDP with increased enforcement efforts had a positive short-term impact on compliance. More specifically, taxpayers increased 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

had no effect on compliance in the long-term. The hypothesis that a once-off VDP with increased enforcement measures increased compliance in the long-term was therefore rejected.

The variable $treatVDPperm*round_7$ had a positive but statistically insignificant coefficient. This showed that a permanent (open-ended) VDP without increased enforcement measures had no significant effect on compliance in the short-term. Thus, this type of VDP was unlikely to generate immediate revenue for the government. The results also showed a positive but statistically insignificant coefficient of $treatVDPperm*rounds_{8-12}$, which implied that a permanent VDP without increased enforcement measures had 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 implied 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 $treatVDPperm\_Audit*rounds_{8-12}$ was positive but statistically insignificant. This suggested that a permanent VDP with increased enforcement measures had 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 increased their compliance levels in the period subsequent to the period in which they are audited. This study also found a negative and significant relationship between income and compliance. It as further found that female taxpayers complied more than male taxpayers. The study found no significant difference in compliance rates between participants who have filed a tax return before and those who never have. 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.

The study also controlled for 'round' effects, which may include participants' experience gained between rounds. That is, compliance choices in subsequent rounds may be influenced by experiences in previous rounds. As such, it is essential to control for rounds effects. The results showed that compliance rates in Rounds One to Ten were not statistically significant, other than that in Round Six. However, taxpayers significantly increased their non-compliance from Round 11 through to Round 12. These results may suggest that subjects reduced their compliance levels as they got 'used' to the experiment.

Table 6.4: Regression results: VDPs

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	0.358 (0.321)	0.294** (0.116)	2.253 (2.435)									
treatVDPonce *round$_1$	-0.055 (0.061)	0.003 (0.066)	0.480 (1.343)									
treatVDPonce *round$_2$	-0.040 (0.061)	-0.031 (0.065)	-0.795 (1.441)									
treatVDPonce *round$_3$	-0.045 (0.061)	-0.053 (0.065)	-1.097 (1.475)									
treatVDPonce *round$_4$	0.014 (0.061)	-0.017 (0.066)	0.137 (1.452)									
treatVDPonce *round$_5$	-0.049 (0.061)	-0.057 (0.066)	-1.641 (1.437)									
treatVDPonce *round$_7$	0.061 (0.061)	0.0274 (0.066)	1.731 (1.531)									
treatVDPonce *round$_8$	-0.062 (0.061)	-0.063 (0.066)	0.930 (1.573)									
treatVDPonce *round$_9$	0.019 (0.061)	0.021 (0.066)	0.919 (1.543)									
treatVDPonce *round$_{10}$	0.029 (0.061)	0.044 (0.066)	0.672 (1.500)									
treatVDPonce *round$_{11}$	0.005 (0.061)	0.001 (0.066)	-1.745 (1.505)									
treatVDPonce *round$_{12}$	-0.010 (0.061)	-0.023 (0.065)	-1.891 (1.476)									
treatVDPonce _Audit				0.283 (0.407)	0.242 (0.159)	-0.865 (2.763)						
treatVDPonce _Audit* round1				0.052 (0.062)	0.077 (0.0663)	1.448 (1.305)						
treatVDPonce _Audit* round$_2$				0.0479 (0.062)	0.0547 (0.066)	1.769 (1.375)						
treatVDPonce _Audit* round$_3$				0.0217 (0.062)	0.011 (0.066)	0.726 (1.445)						
treatVDPonce _Audit* round$_4$				0.0240 (0.062)	-0.004 (0.066)	0.188 (1.459)						
treatVDPonce _Audit* round$_5$				-0.0275 (0.062)	-0.042 (0.066)	-0.653 (1.469)						
treatVDPonce _Audit* round$_7$				0.153** (0.062)	0.125* (0.066)	2.914* (1.519)						
treatVDPonce _Audit* round$_8$				0.084 (0.062)	0.049 (0.066)	2.423 (1.610)						
treatVDPonce _Audit* round$_9$				0.080 (0.062)	0.045 (0.066)	0.221 (1.531)						
treatVDPonce _Audit* round$_{10}$				0.086 (0.062)	0.064 (0.066)	1.016 (1.482)						
treatVDPonce _Audit* round$_{11}$				0.130** (0.062)	0.088 (0.066)	0.592 (1.503)						
treatVDPonce _Audit* round$_{12}$				0.101 (0.062)	0.044 (0.066)	1.122 (1.461)						
treatVDPperm							0.908 (0.654)	0.770*** (0.266)	8.835 (6.817)			
treatVDPperm *round$_1$							-0.093 (0.060)	-0.076 (0.064)	-1.149 (1.421)			
treatVDPperm *round$_2$							-0.025 (0.060)	-0.018 (0.063)	-0.001 (1.543)			
treatVDPperm *round$_3$							-0.051 (0.060)	-0.065 (0.063)	-0.178 (1.557)			
treatVDPperm *round$_4$							-0.016 (0.060)	-0.021 (0.063)	-1.544 (1.700)			
treatVDPperm *round$_5$							-0.042 (0.060)	-0.052 (0.063)	-1.307 (1.617)			
treatVDPperm *round$_7$							0.122** (0.060)	0.101 (0.064)	2.382 (1.648)			
treatVDPperm *round$_8$							-0.042 (0.060)	-0.056 (0.063)	0.987 (1.759)			
treatVDPperm *round$_9$							0.015 (0.060)	0.003 (0.063)	0.683 (1.649)			
treatVDPperm *round$_{10}$							-0.046 (0.060)	-0.028 (0.064)	-1.741 (1.727)			
treatVDPperm *round$_{11}$							0.018 (0.060)	0.008 (0.063)	-0.672 (1.692)			
treatVDPperm *round$_{12}$							-0.035 (0.060)	-0.039 (0.063)	-0.979 (1.685)			
treatVDPperm _Audit										0.371 (0.724)	0.257 (0.278)	-8.047 (6.139)
treatVDPperm _Audit*round$_1$										-0.087 (0.067)	-0.050 (0.072)	-0.186 (1.270)
treatVDPperm _Audit*round$_2$										-0.018 (0.067)	0.002 (0.071)	0.385 (1.346)
treatVDPperm _Audit*round$_3$										-0.009 (0.067)	-0.013 (0.071)	-0.067 (1.420)
treatVDPperm _Audit*round$_4$										0.040 (0.067)	0.027 (0.071)	0.387 (1.396)
treatVDPperm _Audit*round$_5$										0.032 (0.067)	0.000 (0.071)	-0.452 (1.397)
treatVDPperm _Audit*round$_7$										0.139** (0.067)	0.119* (0.072)	2.689* (1.482)
treatVDPperm _Audit*round$_8$										0.053 (0.067)	-0.004 (0.072)	1.126 (1.536)

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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
treatVDPperm_Audit*round$_9$										0.130* (0.067)	0.0719 (0.072)	0.727 (1.459)
treatVDPperm_Audit*round$_{10}$										0.100 (0.067)	0.0842 (0.071)	0.587 (1.398)
treatVDPperm_Audit*round$_{11}$										0.023 (0.067)	-0.005 (0.071)	-0.378 (1.438)
treatVDPperm_Audit*round$_{12}$										-0.037 (0.067)	-0.054 (0.071)	-0.219 (1.409)
round$_1$	0.096** (0.043)	-0.020 (0.048)	0.832 (1.072)	0.096** (0.045)	-0.006 (0.050)	0.166 (1.015)	0.096** (0.043)	0.008 (0.047)	0.782 (1.038)	0.096** (0.048)	-0.012 (0.053)	0.784 (1.018)
round$_2$	0.018 (0.043)	-0.043 (0.047)	-0.580 (1.107)	0.018 (0.045)	-0.034 (0.049)	-0.650 (1.061)	0.018 (0.043)	-0.025 (0.046)	-0.467 (1.085)	0.018 (0.048)	-0.038 (0.052)	-0.411 (1.066)
round$_3$	0.039 (0.043)	0.026 (0.047)	0.450 (1.202)	0.039 (0.045)	0.028 (0.048)	0.358 (1.140)	0.039 (0.043)	0.030 (0.046)	0.388 (1.137)	0.039 (0.048)	0.027 (0.051)	0.477 (1.144)
round$_4$	-0.029 (0.043)	-0.002 (0.047)	-0.138 (1.165)	-0.029 (0.045)	-0.007 (0.048)	-0.110 (1.133)	-0.030 (0.043)	-0.009 (0.046)	-0.112 (1.146)	-0.029 (0.048)	-0.004 (0.051)	-0.073 (1.121)
round$_5$	0.019 (0.043)	0.035 (0.047)	0.905 (1.142)	0.019 (0.045)	0.033 (0.048)	0.767 (1.146)	0.019 (0.043)	0.029 (0.046)	0.748 (1.137)	0.019 (0.048)	0.033 (0.051)	0.792 (1.114)
round$_7$	-0.070 (0.043)	-0.036 (0.047)	-1.232 (1.270)	-0.070 (0.045)	-0.043 (0.049)	-1.371 (1.225)	-0.070 (0.043)	-0.041 (0.046)	-1.513 (1.259)	-0.070 (0.048)	-0.036 (0.052)	-1.285 (1.211)
round$_8$	-0.029 (0.043)	-0.002 (0.047)	-1.015 (1.332)	-0.029 (0.045)	-0.007 (0.048)	-1.063 (1.344)	-0.029 (0.043)	-0.009 (0.046)	-1.236 (1.343)	-0.029 (0.048)	-0.004 (0.051)	-1.032 (1.298)
round$_9$	-0.055 (0.043)	-0.041 (0.047)	-0.343 (1.249)	-0.055 (0.045)	-0.041 (0.048)	-0.056 (1.246)	-0.055 (0.043)	-0.047 (0.046)	-0.148 (1.250)	-0.055 (0.048)	-0.043 (0.051)	-0.095 (1.218)
round$_{10}$	-0.067 (0.043)	-0.057 (0.047)	-0.241 (1.203)	-0.067 (0.045)	-0.057 (0.048)	0.061 (1.190)	-0.067 (0.043)	-0.062 (0.046)	0.061 (1.177)	-0.067 (0.048)	-0.059 (0.051)	0.009 (1.145)
round$_{11}$	-0.103** (0.043)	-0.075 (0.047)	0.141 (1.200)	-0.103** (0.045)	-0.080* (0.048)	0.158 (1.216)	-0.103** (0.043)	-0.082* (0.046)	0.138 (1.190)	-0.103** (0.048)	-0.077 (0.051)	0.194 (1.178)
round$_{12}$	-0.151*** (0.043)	-0.115** (0.047)	0.554 (1.175)	-0.151*** (0.045)	-0.122** (0.048)	0.381 (1.162)	-0.151*** (0.043)	-0.124*** (0.046)	0.395 (1.164)	-0.151*** (0.048)	-0.118** (0.052)	0.398 (1.139)
Total income		-0.0004*** (0.000)	-0.009*** (0.002)		-0.0003** (0.000)	-0.011*** (0.002)		-0.0003** (0.000)	-0.009*** (0.002)		-0.0004** (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)
Other demographic variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
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: Author's own calculations.

6.7 DISCUSSION OF FINDINGS AND POLICY IMPLICATIONS

Results from this study showed that a once-off VDP without increased enforcement efforts had an insignificant effect on compliance, both in the short- and long-term. This finding was contrary to Torgler *et al.* (2003), who suggested that a reprieve may introduce anticipatory behaviour amongst taxpayers, which encouraged them to reduce their tax compliance. The study therefore rejected the hypothesis that a once-off VDP that was not accompanied with increased enforcement reduces compliance. This finding seems plausible, considering that participants in this study were aware (as it was explicitly clear on the computer screens) that the reprieve window was a once-off opportunity. As such, it was unlikely that they expected more reprieves. Results from this study further showed that a once-off VDP with increased enforcement measures increased compliance in the short-term. This implied that this type of VDP may enable the government to raise immediate revenue. However, this type of VDP has an insignificant long-term effect on compliance. Thus, a VDP with increased

enforcement measures has no material effect on compliance in the long-term, in that it does not increase nor decrease future compliance. In summary, these findings indicated that a once-off VDP was effective (at most) in the short-term, and only when it was complemented by increased enforcement measures.

The results also showed that a permanent VDP without increased enforcement measures had no significant effect on compliance, both in the short- and long-term. This type of VDP is unlikely to be a fiscal solution nor a fiscal harm. Thus, contrary to Torgler *et al.* (2003) and Saraçoğlu & Lu (2011), this study found no evidence that taxpayers reduce their compliance even when they are aware that the reprieve is not a once-off window. This finding seems plausible considering that, under a VDP regime, taxpayers are still required to pay their back taxes. The requirement to pay the tax owed reduces the benefit of evasion, which may reduce taxpayers' motivation to reduce compliance. As such, the study rejected the hypothesis that a permanent VDP without increased enforcement efforts reduced compliance.

As is the case with a once-off VDP, a permanent VDP with increased enforcement measures causes taxpayers to increase their compliance levels in the short-term. The study therefore rejected the hypothesis that a permanent VDP that was accompanied with increased enforcement measures increased compliance in the long-term. However, this type of VDP had no effect on compliance in the long-term. Thus, as is the case with once-off VDPs, permanent VDPs are only effective in the short-term, and only when augmented with increased enforcement measures.

Importantly, this study showed that a once-off VDP was comparably more effective than a permanent VDP. As suggested by Alm *et al.* (1990), taxpayers may construe a once-off VDP to be a sign of commitment by the authorities towards reducing non-compliance. In response, taxpayers would take advantage of the once-off reprieve window to rectify their tax status. In contrast, under a permanent VDP, taxpayers may delay paying up their back taxes as the reprieve window would be open-ended. In other words, a permanent VDP may reduce taxpayers' intrinsic motivation to comply, since the reprieve does not expire. In light of this discussion, it is recommended that authorities avoid permanent VDPs.

Considering that the effectiveness of VDPs depends on the authorities' ability to augment the reprieve facility with increased frequency of audits, it is imperative that the authority has an effective audit system (i.e. an audit system with a high capacity to detect evasion). Further, the authority should ensure that the audits are conducted in a cost-effective manner. Otherwise, audit expenses may end up reducing the revenue that is intended to be collected. One such initiative is to decentralise the auditing responsibilities to SARS branch offices. This improves the frequency of audit and the authority's capacity to detect non-compliance, as tax returns are audited in small batches across the country. It is also imperative to expedite the synchronisation of the individual taxpayers' database with that of Home Affairs and that of the Companies and Intellectual Property

Commission (CIPC). The harmonisation of these datasets will improve SARS' administrative efficiency in detecting evasion (see Section 2.4.2).

The standard tax evasion model (the deterrent model) suggests that taxpayers' past experiences do not influence their compliance decisions in subsequent periods, suggesting that there is independence between tax periods (see Section 5.5.2). To investigate this assertion, this study examined the effect of a previous audit on compliance in the subsequent period. Contrary to the assertion by the standard deterrence model, results from this study found that taxpayers increased their compliance levels in the period subsequent to the period in which they were audited. These findings suggested that taxpayers, in anticipation of future audits, increased their compliance levels in periods subsequent to the period in which they were audited. This finding is in line with the assertion by Alm *et al.* (2009), that there is the possibility that individuals' current actions (behaviour) can be influenced by their past experiences. This finding is also in line with results in the previous chapter (see Section 5.6.3).

This study also found a negative and significant relationship between income and compliance, in that compliance declined as taxpayers' income increased. Importantly, the income in this study was assigned to participants as an endowment (which represented any form of non-salaried income). The negative relationship between income and compliance therefore suggested that high-income non-salaried income taxpayers had a higher non-compliance rate than the low-income taxpayers, a finding that was consistent with results in the previous chapter (see Section 5.6.3). This finding also confirmed the assertion that individual taxpayers are risk-averse utility maximisers (see Section 5.2).

Results from this study showed 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 confirmed the findings of Engida & Baisa (2014) and Kastlunger, Dressler, Kirchler, Mittone & Voracek (2010), who found that women are more honest than men. This finding was line with the findings in the previous chapter (see Section 5.6.3).

Considering that the experimental setting for this study used explicit tax terms, it is possible that subjects who have been involved in tax filing before produced different cognitive responses from those of non-tax filers. Participants' filing experiences have therefore been controlled for in the regression model. However, the results showed no significant differences in compliance levels between these two groups of participants. This finding confirmed 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. This finding is line with the findings in the previous chapter (see Section 5.6.3).

6.8   CONCLUSION

This chapter employed controlled laboratory experiments to investigate individual taxpayers' behavioural responses to VDPs. Results showed that both once-off and permanent VDPs were 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 had no long-term effects on compliance. This was 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 as 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).

CHAPTER 7

CONCLUSIONS AND IMPLICATIONS OF THE STUDY

7.1   INTRODUCTION

South Africa, like any other country, is concerned about the need to ensure that everyone complies with the requirements of the tax legislation. As such, the government has instituted a variety of measures including audits, penalties and reprieves to tackle non-compliance. Despite these efforts, the extent and scope of non-compliance (the tax gap) remains unknown. Knowledge about the tax gap is necessary to guide authorities in formulating, designing and implementing more effective compliance-enforcement measures. It is against this background that this study employed some micro-simulation models to estimate the extent and composition of the country's PIT gap.

In addition, although the government has been instituting audits, penalties and reprieves to enhance compliance, evidence from empirical studies on the efficacy of these instruments are mixed, making it imperative to further investigate how these measures influence compliance. In light of this discussion, this thesis employed controlled laboratory experiments to examine how taxpayers responded to audit rates, penalty rates and VDPs.

7.2   CONTRIBUTION OF THE STUDY

This research contributed to the literature on PIT evasion in at least three ways. Firstly, it contributed on the literature on how to estimate the country's tax gap. This knowledge is important for policymakers and tax administrators, to improve the performance of the tax system, particularly in reducing tax evasion. The study established that South Africa's PIT gap declined significantly between 2005/06 and 2010/11. There was strong evidence that non-salaried individual taxpayers constituted the bulk of the country's PIT gap. The tax gaps were estimated using micro-simulation models, designed in line with the country's Individual Tax Return, the ITR 12 form. The model can therefore be used to estimate the country's tax gap in subsequent years, thereby establishing the trend of the tax gap. Importantly, although the micro-simulation model was designed specifically for the South African case study, it can easily be adapted to suit other country applications. As such, this study provided a strong base on how to estimate PIT gaps, which is a critical tool in tackling non-compliance and preventing its occurrence.

Secondly, the study contributed to the tax knowledge by establishing how salaried and non-salaried taxpayers respond to changes in audit and penalty rates. Existing studies have largely been focused on the effect of deterrence measures (audits and penalties) on tax compliance in its aggregated form. However, considering that the PIT system is constituted of primarily two types of taxpayers - salaried and non-salaried - it is imperative to examine how these two groups of taxpayers respond to the tax instruments. This study showed that salaried and non-salaried taxpayers respond

differently to changes in audit rates and penalty rates. This research therefore contributed to the existing literature on how audits and penalties may impact PIT compliance.

The third broad contribution of this thesis was to establish how individual taxpayers responded to VDPs. This is of great relevance given the wide application of the VDPs across many countries (including South Africa), given the adoption of the CRS. This study showed that VDPs (both once-off and permanent) may influence taxpayers to increase their compliance levels, when they are complemented with increased enforcement efforts. As this research showed, VDPs were only effective in the short-term. This knowledge is important in the designing and implementation of VDPs and, importantly, this study was the first to examine how taxpayers responded to the two different forms of VDPs: once-off and open-ended (permanent) VDPs. Although this study focused on South Africa, the lessons learnt may be applicable to other developing countries in Africa (and beyond).

7.3   SUMMARY OF KEY FINDINGS

7.3.1   Estimation of the tax gap

Following Ahmed & Rider (2013), this study employed a micro-simulation model to estimate South Africa's PIT gap, using the Income and Expenditure Survey data of 2005/06 and 2010/11 from Stats SA. The study showed that, in the absence of tax expenditures, the government had the potential to collect R382.3 billion worth of tax revenue from individual taxpayers in 2005/06, and R449.6 billion in 2010/11[44]. However, due to tax expenditures, the potential tax liabilities declined to R276.4 billion and R316.6 billion in 2005/06 and 2010/11, respectively, resulting in policy gaps of R105.9 billion and R133 billion, in that order.

The theoretical tax liability from the taxable income for all individual taxpayers was found to be R276.4 billion for the 2005/06 tax year. However, only R216.3 billion was collected, resulting in a compliance gap of R60.1 billion and a compliance rate of 78.3 percent. Notably, the tax revenue forgone due to non-compliance is equivalent to 21.7 percent of the potential tax revenue. In 2010/11 the government collected R290.4 billion worth of PIT revenue, against the theoretical tax liability of R316.6 billion, producing a compliance gap of R26.2 billion and a compliance rate of 91.7 percent.

In 2005/06, of the R276.4 billion potential PIT revenue, R218.2 billion constituted PAYE. However, PAYE collections amounted to R201 billion, implying a PAYE tax gap of R25.6 billion and a compliance rate of 92.1% percent. In 2010/11, instead of collecting R265.1 billion worth of PAYE, the government managed to collect R264.8 billion and was prejudiced by R0.3 billion through non-compliance; hence, a 99.9 percent compliance rate.

The theoretical tax liability from the taxable income for all non-salaried individual taxpayers was found to be R58.2 billion for the 2005/06 tax year. However, their actual payments totalled R15.3

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[44] The amounts are in real values (2017 = 100).

billion. Thus, the government lost a total of R42.9 billion worth of revenue through tax evasion by non-salaried individual taxpayers. The compliance rate was 26.3 percent. In 2010/11, instead of collecting R51.5 billion from this same group of taxpayers, only R25.6 billion was collected, producing a tax gap of R25.9 billion and a compliance rate of 49.7 percent.

In terms of the composition of the total PIT gap, salaried taxpayers contributed 28.5 percent in 2005/06, a figure that declined to 1.1 percent in 2010/11. Conversely, 71.5 percent of the 2005/06 total PIT gap came from non-salaried individual taxpayers. Despite a significant improvement in their compliance rate (from 26.3 to 49.7 percent), non-salaried taxpayers' share of the total tax gap increased to 98.9 percent in 2010/11.

7.3.2   Individual taxpayers' behavioural responses to deterrence measures

The study employed controlled laboratory experiments to investigate taxpayers' behavioural responses to changes in audits and penalty rates. Controlled laboratory experiments have become a standard approach in examining taxpayers' behaviour (Alm & Jacobson, 2007; Blackwell, 2007; Kleven et al., 2011). Results from this study showed that higher audit rates influenced individual taxpayers to increase their compliance levels. This applied to both salaried and non-salaried taxpayers. However, the effect of audit rates was higher on non-salaried income compliance than on salaried income compliance. Furthermore, this study found that higher penalty rates influenced taxpayers to increase their compliance levels. As is the case with audit rates, penalty rates had a higher impact on non-salaried individual taxpayers than on salaried individual taxpayers.

This study also established that audit and penalty rates had a negative and statistically significant joint effect on both salaried and non-salaried compliance rates. In other words, individual taxpayers reduced their compliance rates when subjected to a combination of higher audit rates and higher penalty rates. The impact was larger on salaried taxpayers than on non-salaried taxpayers, and the decline in compliance rates (following an increase in both audits and penalty rates) confirmed the proposition of the slippery slope model by Kirchler, Hoelzl & Wahl (2008) that high enforcement reduced taxpayers' intrinsic motivation to comply, hence reducing voluntary compliance.

7.3.3   Individual taxpayers' behavioural responses to VDPs

Using experimental methods, the study found that a once-off VDP without increased enforcement measures has a positive but statistically insignificant effect on compliance, both in the short- and the long-term. Thus, this type of VDP is unlikely to generate immediate revenue nor reduce future compliance. This study also established that a once-off VDP with increased enforcement efforts had a positive and significant short-term effect on compliance. This implied that a once-off VDP was likely to generate immediate revenue for the government, only when it was accompanied by increased enforcement. However, the long-term effect of a once-off VDP with increased enforcement on compliance was found to be positive but insignificant. In other words, a once-off VDP with increased

enforcement efforts did not have any significant effects on future compliance levels. Thus, this study found no evidence that taxpayers' compliance levels may be influenced by non-economic factors in a VDP regime.

A permanent (open-ended) VDP without increased enforcement measures was found to have a positive but statistically insignificant effect on compliance, both in the short- and the long-term. Thus, this type of VDP was unlikely to generate immediate revenue or increase future compliance levels. It was also established that a permanent VDP with increased enforcement efforts increased compliance in the short-term. However, this type of VDP had a positive but insignificant effect on compliance in the long-term. In other words, a VDP with increased enforcement efforts enables the government to generate some immediate revenue but does not have any material effect on future compliance levels.

In summary, VDPs (both once-off and permanent) are effective in the short-term, but only when they are augmented with increased enforcement efforts. However, a once-off VDP has a higher effect on compliance than a permanent VDP. It was also established that VDPs (both once-off and permanent) had no material effect on future compliance. This is regardless of whether the VDP was with or without increased enforcement efforts. Importantly, the fact that taxpayers increased their compliance levels only when the VDP was accompanied with increased enforcement measures may suggest that non-economic factors have a insignificant effect on taxpayers' compliance behaviour.

7.4   RESEARCH IMPLICATIONS

The main objective of this study was to contribute to the empirical understanding of the size and scope of the PIT gap, and establish individual taxpayers' behavioural responses to audit rates, penalty rates and VDPs in South Africa. This section discusses the research implications of the key findings.

Results from the tax gap analysis (Chapter 3) showed a significant decline in the overall PIT gap between 2005/06 and 2010/11, implying an improvement in the overall compliance rate. Following Kirana (2010) and Tambun & Kopong (2017), the overall improvement in PIT compliance can be attributed to government-induced tax reforms, particularly modernisation initiatives e.g. e-filing. These reforms made it relatively less costly to comply, hence motivating taxpayers to oblige with the requirements of the tax legislation. The reduction in the PIT gap can also be ascribed to the ITR programme, a compulsory registration drive that led to a significant increase in the number of individual registrants in 2010/11. A decline in the overall tax gap implied that the government's efforts to stimulate compliance had been effective.

The study also found that non-salaried individual taxpayers had a higher non-compliance rate than salaried individual taxpayers. A higher non-compliance rate by non-salaried income earners confirms that self-reporting is more prone to abuse than third party reporting. These results confirmed the

finding by Schneider (2005) and Paulus (2015) that non-salaried taxpayers have more opportunities to evade taxes than salaried taxpayers. In other words, self-assessment provided taxpayers with more opportunities to misreport income, as compared to third party reporting. Paulus (2015: 9) highlighted that, because there are few incentives for employers to misreport employees' income, it would take employees to collude with the employers to evade. Depending on the availability of such opportunities, it is more difficult to evade salaried income tax than non-salaried income tax (Paulus, 2015: 24). The findings are further confirmed by Ahmed & Rider (2013: 343), who also argued that a withholding tax regime is a more effective revenue mobilisation technique than self-assessment.

Results from Chapter 5 indicated that there was a positive relationship between the audit rate and compliance. Similarly, taxpayers increased compliance when subjected to higher penalty rates. These findings confirmed the propositions of the economics of crime theory (Becker, 1968) that audits and penalties increased compliance. However, the findings of the study showed that audits were more effective than penalties. It is, therefore, imperative for the authorities to prioritise increasing the frequency of audits.

The study further showed that taxpayers reduced their compliance levels when subjected to a combination of higher audit rates and higher penalty rates. The negative joint effect of higher audit and penalty rates on compliance rates can be attributed to a number of factors. For instance, taxpayers may construe a combination of higher audit and penalty rates as a confirmation by authorities that non-compliance is widespread, which is a sign of the lack of capacity and ability to enforce compliance (Gangl, Torgler, Kirchler & Hofmann, 2014; Mohdali, Isa & Yusoff, 2014). Such a perception motivates taxpayers to reduce their compliance levels (Alm & Martinez, 2003: 150–151). Wahl et al., (2010: 386) highlighted that taxpayers may construe an increase in the audits and penalty rates as a sign of distrust by the tax authority. As trust is inherently reciprocal in nature, taxpayers would in turn lose trust in the authority, leading them to reduce their compliance levels; hence, the negative joint effect of higher audit and penalty rates on compliance. These findings implied that it was essential for the authorities to consider taxpayers' perceptions when enforcing compliance.

Chapter 6 investigated how VDPs affect compliance. Results from this study showed that a VDP (once-off or permanent) was only effective when accompanied by increased enforcement efforts. However, they were only effective in the short-term, implying that this may enable the government to raise immediate revenue. Furthermore, it was established that VDPs had no material effect on future compliance levels (i.e. they did not increase or reduce future compliance). This is regardless of whether the reprieve was once-off or permanent, or whether the VDP was with or without increased enforcement measures. This may imply that the effectiveness of a VDP depends on enforcement. Thus, this study found no evidence that taxpayers may increase their compliance levels based on non-economic factors. Furthermore, findings from this study were contrary to Torgler

et al. (2003) and Saraçoğlu & Lu (2011), who suggested that a reprieve may introduce anticipatory behaviour amongst taxpayers, which encouraged them to reduce their tax compliance. This finding seems plausible, considering that (under a VDP regime), taxpayers are still required to pay their back taxes, a condition that reduces the benefit of evasion and reduces the intrinsic motivation to reduce future compliance.

Importantly, this study showed that a once-off VDP was comparably more effective than a permanent VDP. As suggested by Alm et al. (1990), taxpayers may construe a once-off VDP as a sign of commitment by authorities towards reducing non-compliance. In response, taxpayers would take advantage of the one-off reprieve window to rectify their tax status. In contrast, under a permanent VDP, taxpayers may procrastinate paying up their back taxes, since the reprieve window would be open-ended. In other words, a permanent VDP may reduce taxpayers' intrinsic motivation to comply, since the reprieve did not expire. In light of this discussion, it is recommended that authorities avoid permanent VDPs.

Considering that the effectiveness of VDPs depends on the authorities' ability to augment the reprieve facility with increased frequency of audits, it is imperative that the authority have an effective audit system (an audit system with a high capacity to detect evasion). Further, the authority should ensure that the audits are conducted in a cost-effective manner. Otherwise, audit expenses may end up reducing the revenue that is intended to be collected. For instance, the tax authority may reduce costs by decentralising the auditing responsibilities to SARS branch offices.

7.5   CONCLUSIONS AND SUGGESTIONS FOR FUTURE RESEARCH

This dissertation sought to estimate the scale and composition of the PIT gap, establishing individual taxpayers' behavioural responses to some tax instruments in South Africa. As such, this study provided some fundamental insights into the performance of South Africa's PIT system. The study used HIE data from the Stats SA. It would be more informative to establish the country's tax gap using more recent individual-level data than using household-level data. This is because household level data may push incomes to higher tax brackets, causing an overestimation of theoretical tax liabilities and, ultimately, the tax gaps. Due to data constraints, the study used household-level data. The most recent dataset covered the years 2005/06 to 2010/11; as such, this study was limited to those periods. However, it is the case that household survey data have several limitations. For instance, the Household Income and Expenditure survey data may suffer from missing values due to non-responses, and disqualified responses, among others, but these values cannot be excluded from the dataset because the individuals are included in the weights of the survey and will affect the population total (Van Heerden & Schoeman, 2013). Although this limitation can be corrected through statistical methods, survey data is also often plagued by underreporting, particularly by the self-employed and high-income earners. As such, it is possible that results from this study underestimated the extent of South Africa's PIT gap. It would be necessary to check the robustness

of these results using alternative datasets and methodologies. One methodology is the HMRC approach, which uses audited data produced and made available by the tax authority. However, due to confidentiality of taxpayers' information, tax audit data is not easily accessible for the purposes of academic research, particularly in South Africa.

Despite the limitations discussed above, results from this study revealed that South Africa had a relatively high performing PIT system, when compared to Pakistan (see Ahmed & Rider, 2013). However, the South African PIT gap is lower than that of developed countries such as Sweden and the UK, whose PIT compliance rates are at 95 percent. It would be more insightful to compare South Africa's PIT gap with other developing countries'. However, apart from Pakistan, there seems to be no other study on PIT in developing countries.

The study also added to the growing body of literature on taxpayers' responses to changes in audit rates and penalty rates. The study used a novel experimental setting, whereby compliance was disaggregated into salaried and non-salaried, which gave a clearer effect of deterrence measures on compliance. Notably, this study used experimental methods with student subjects. Although there is vast evidence that show no cognitive differences between student subjects and non-student subjects, it will be necessary to replicate this study with non-student subjects and examine the robustness of the results from this study.

The study further contributed to the growing body of literature on taxpayers' responses to VDPs. This study used laboratory experiments to examine the effect of once-off and permanent VDPs on compliance. This was the first study to examine these two types of reprieves. Considering that this study used controlled laboratory experiments, it would be imperative to 'replicate' the study in a natural field experiment, whereby the study is carried in a natural environment. However, although they may carry a higher external validity than controlled laboratory experiments, natural field experiments are costly and impractical in certain circumstances.

This study could further be expanded by incorporating informal laws (e.g. trust and fairness) in the experimental setting. For instance, the investigator may expand the experiment by introducing a public good, which will be shared amongst participants in exchange of tax commitments. The public shares may be varied to examine how taxpayers' respond when they feel they are unfairly treated.

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APPENDIX A: DISTRIBUTION OF SUBJECTS ACROSS SESSIONS

Table A.1: Distribution by age

Age (years)	Session				Total
	1	2	3	4	
19	30	40	20	20	110
20	60	60	150	100	370
21	120	100	110	110	440
22	170	100	140	80	490
23	60	50	20	20	150
24	40	20	0	30	90
25	20	20	20	20	80
26	0	0	40	30	70
28	0	0	0	10	10
29	10	10	0	0	20
32	0	10	0	0	10
Total	510	410	500	420	1,840

Source: Author's own calculations.

Table A.2: Distribution by gender

Gender	Session				Total
	1	2	3	4	
Male	260	270	270	230	1,030
Female	250	140	230	190	810
Total	510	410	500	420	1,840

Source: Author's own calculations.

Table A.3: Distribution by citizenship

Citizenship	Session				Total
	1	2	3	4	
South African	430	310	430	260	1,430
Non-South African	80	100	70	160	410
Total	510	410	500	420	1,840

Source: Author's own calculations.

Table A.4: Distribution by religion

Religion	Session				Total
	1	**2**	**3**	**4**	**Total**
Catholic	40	70	40	60	210
Baptist	10	20	10	10	50
Protestant/ Pentecostal	140	70	120	60	390
Muslim	30	0	20	0	50
No religion	80	90	110	110	390
Don't know	0	20	40	30	90
Prefer not to answer	80	10	10	10	110
Other	130	130	150	140	550
Total	510	410	500	420	1,840

Source: Author's own calculations.

Table A.5: Distribution by ethnicity

Ethnicity	Session				Total
	1	**2**	**3**	**4**	**Total**
White	270	220	200	110	800
Black	120	100	210	220	650
Coloured	100	60	70	50	280
Asian	20	10	10	20	60
Other	0	20	0	20	40
Prefer not to answer	0	0	10	0	10
Total	510	410	500	420	1,840

Source: Author's own calculations.

Table A.6: Distribution by employment

Employment status	Session				Total
	1	**2**	**3**	**4**	**Total**
Part-time	170	70	130	60	430
Self-employed	0	10	0	10	20
Not employed	340	330	370	350	1,390
Total	510	410	500	420	1,840

Source: Author's own calculations.

Table A.7: Distribution by current level of study

Current level of study	Session				Total
	1	2	3	4	
Second year	110	80	220	90	500
Third year	270	230	220	190	910
Postgraduate	130	100	60	140	430
Total	510	410	500	420	1,840

Source: Author's own calculations.

Table A.8: Distribution by household income level

Income bracket	Session				Total
	1	2	3	4	
Less than R50,000	40	120	90	40	290
R50,000 to R149,999	60	40	90	50	240
R150,000 to R249,999	70	40	60	90	260
R250,000 to R349,999	40	10	30	40	120
R350,000 to R449,999	50	10	60	30	150
More than R449,999	150	130	110	130	520
Prefer Not to Answer	100	60	60	40	260
Total	510	410	500	420	1,840

Source: Author's own calculations.

Table A.9: Distribution by marital status

Marital status	Session				Total
	1	2	3	4	
Never married	460	390	480	400	1,730
Married	0	10	0	0	10
Separated	30	10	20	10	70
Divorced	20	0	0	0	20
Living together but not married	0	0	0	10	10
Total	510	410	500	420	1,840

Source: Author's own calculations.

Table A.10: Distribution by tax filing experience

Tax-filing experience	Session				Total
	1	**2**	**3**	**4**	
Yes	40	70	50	40	200
No	470	340	450	380	1,640
Total	510	410	500	420	1,840

Source: Author's own calculations.

APPENDIX B: AUDIT STRATEGY

Figure B.1: Virtual bingo cage
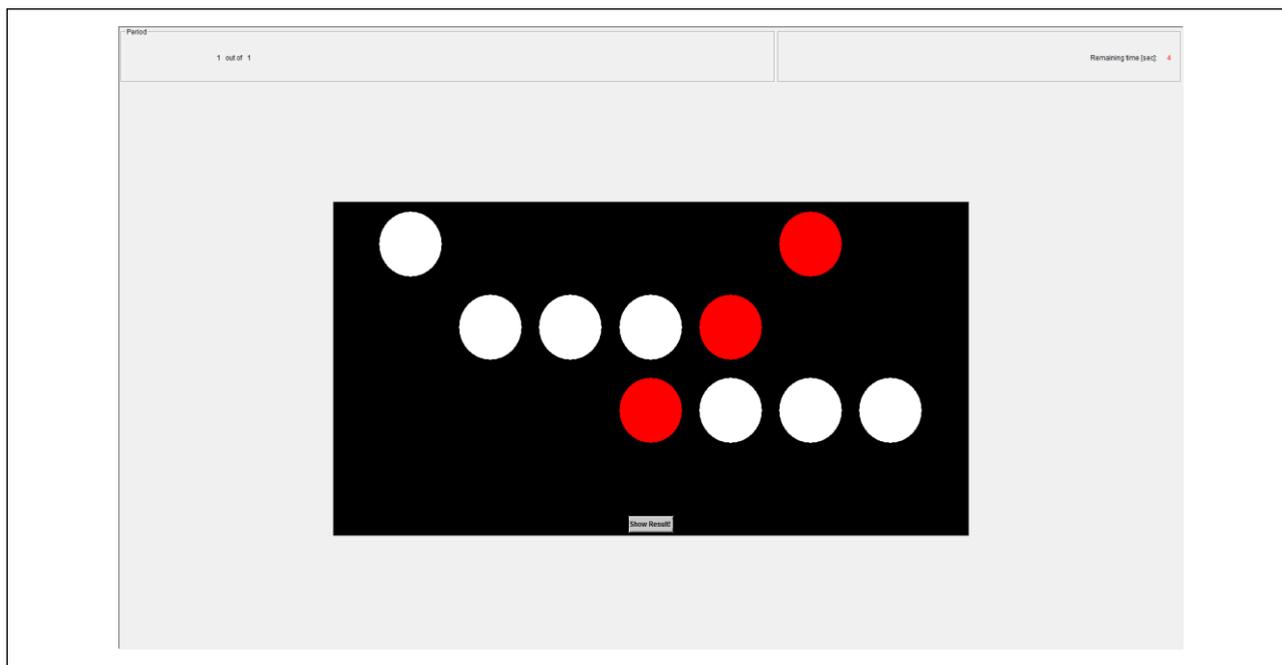
Figure B.2: Audit outcome
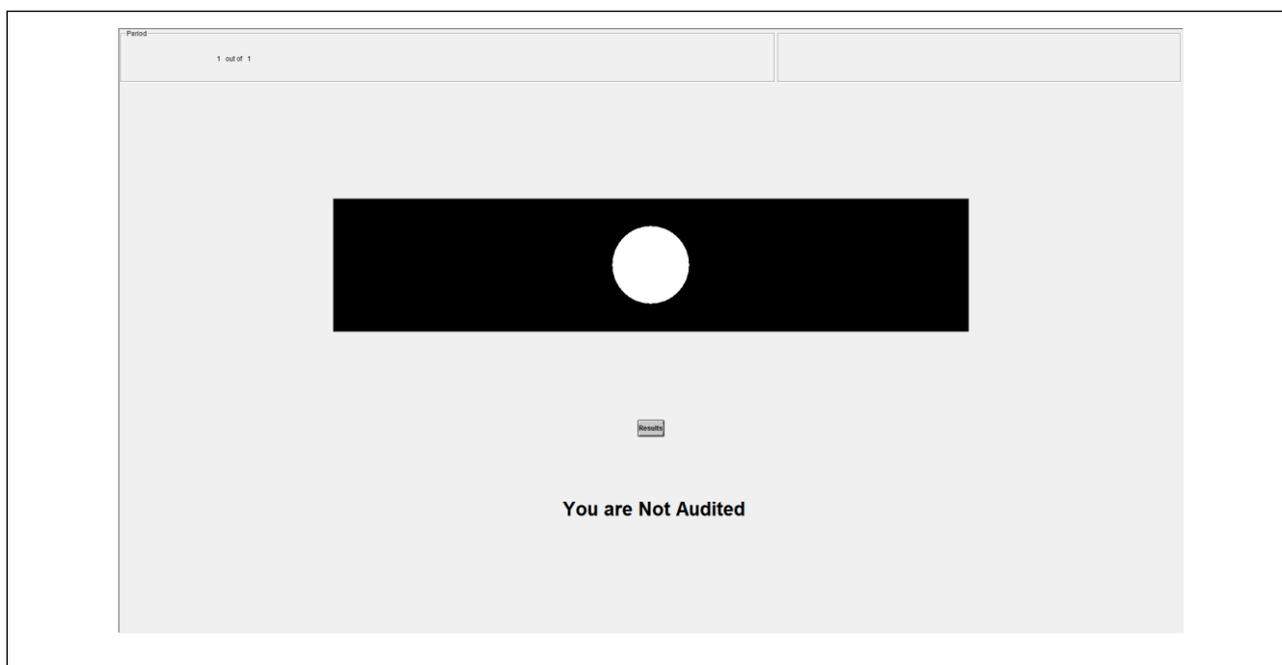
APPENDIX C: TAX CALCULATOR

Figure C.1: Tax Calculator

APPENDIX D: INSTRUCTION SHEETS – DETERRENCE MEASURES

Instruction sheet for Sessions 1 & 3

This is an experimental study about economic decision-making. The exercise will last for an hour. You will receive R30 for your participation and will have the opportunity to increase this amount based on the decisions you make during the exercise. Your earnings will be paid to you in cash at the end of the study. Your decisions and payments will be kept strictly confidential.

The decisions made in this study are tax reporting decisions. In each round, you will be given some endowment income. You will earn some additional income by performing a simple task of counting the number of ones in grid, in the shortest possible time. The amount earned is determined by one's performance in the task. Thus, in each round, you will be possessing two types of incomes (earned and endowment income). Below is how your decisions affect your earnings.

In each round, you will have to report your income (i.e. both incomes) to a tax authority and pay taxes on reported income. The tax rate is 30%. Thus, your taxes will be 0.30* (reported income). After submitting your taxes, there is a chance that you will be audited by the tax authority. The probability of audit will be announced in each round. A computer will use a random number generator to decide whether the audit will occur. If audited, any unreported salaried income is detected; and any undeclared endowment income may detected but at a pre-announced probability of 50%. That is, if you are audited, there is a 100% chance that all unreported salaried income is detected; and a 50% chance that all unreported endowment income is detected.

If unreported income is detected, you will be required to pay a fine equivalent to 1.5 times the unpaid taxes. In other words, if you have unreported income and is detected, a penalty which equals 1.5*0.3*(actual income - reported income) will be subtracted from your after-tax-income to get your final income for the round.

Below is how your earnings will be determined

If you are not audited, your earnings for the round will be:

Actual income – 0.30 (reported income)*

If you are audited, your earnings for the round will depend on the penalty rate and be:

Actual income minus taxes paid minus penalty for undisclosed income, i.e.

Earnings = actual income – 0.30(reported income) – 1.5*0.3 (actual income-reported income) or simply, actual income – reported tax – 1.5*(tax owed – reported tax).*

Examples

These examples will demonstrate the type of decision you will be making and how your earnings will be determined.

Example 1: Suppose your income for the round is R50 and that you report R50 as your income and the penalty rate is 1.5 times the unpaid tax. Then you will pay 0.30*R50.00 = R15.00 in taxes. Thus, your tax owed is R15.00.

If not audited, your earnings for the round will be R50 – R15.00 = R35.00

If audited, your earnings for the round will be R50 – R15.00 = R35.00

Example 2: Suppose your income for the round is R50.00, and that you report R30.00 as your income, and the penalty rate is 1.5 times the unpaid tax. Then your tax owed will be 0.30*R50.00 = R15.00; Tax reported will be 0.30*R30 = R9.00.

If not audited, your earnings for the round will be R50 – R9.00 = R41.00

If audited and detected all unreported income of R20.00, (where R20 = R50 – R30), you will be required to pay 1.5 times the unpaid tax. Your earnings for the round will be R50 – R9.00 – 1.5(R15.00 – R9.00) = R32.00

You will participate in 10 rounds, but only one round count towards earnings. This is determined by rolling a 10-sided die at the end of the exercise. Thus, all rounds have an equal chance of being selected and no one knows in advance which one will be chosen. Importantly, you will be paid your earnings in cash.

If you have any questions, please your hand and we will come there to assist you.

Instruction sheet for Sessions 2 & 4

This is an experimental study about economic decision-making. The exercise will last for an hour. You will receive R30 for your participation and will have the opportunity to increase this amount based on the decisions you make during the exercise. Your earnings will be paid to you in cash at the end of the study. Your decisions and payments will be kept strictly confidential.

The decisions made in this study are tax reporting decisions. In each round, you will be given some endowment income. You will earn some additional income by performing a simple task of counting the number of ones in grid, in the shortest possible time. The amount earned is determined by one's performance in the task. Thus, in each round, you will be possessing two types of incomes (earned and endowment income). Below is how your decisions affect your earnings.

In each round, you will have to report your income (i.e. both incomes) to a tax authority and pay taxes on reported income. The tax rate is 30%. Thus, your taxes will be 0.30* (reported income). After submitting your taxes, there is a chance that you will be audited by the tax authority. The

probability of audit will be announced in each round. A computer will use a random number generator to decide whether the audit will occur. If audited, any unreported salaried income is detected; and any undeclared endowment income may detected but at a pre-announced probability of 50%. That is, if you are audited, there is a 100% chance that all unreported salaried income is detected; and a 50% chance that all unreported endowment income is detected.

If unreported income is detected, you will be required to pay a fine on the unpaid taxes. You will pay a fine that ranges between 1.5 and 3 times the unpaid taxes. In other words, if you have unreported income and is detected, a penalty which equals 1.5*0.3*(actual income - reported income) or 3.0*0.3*(actual income - reported income) will be subtracted from your after-tax-income to get your final income for the round.

<u>Below is how your earnings will be determined</u>

If you are not audited, your earnings for the round will be:

Actual income – 0.30* (reported income)

If you are audited, your earnings for the round will depend on the penalty rate and be:

Actual income minus taxes paid minus penalty for undisclosed income, i.e.

Earnings = actual income-0.30*(reported income)-1.5*0.3 (actual income-reported income) or simply, actual income – reported tax – 1.5*(tax owed – reported tax).

If the penalty rate is 3.0, your earnings will be, actual income – reported tax – 3.0*(tax owed – reported tax).

<u>Examples</u>

These examples will demonstrate the type of decision you will be making and how your earnings will be determined.

Example 1: Suppose your income for the round is R50 and that you report R50 as your income and the penalty rate is 1.5 times the unpaid tax. Then you will pay 0.30*R50.00 = R15.00 in taxes. Thus, your tax owed is <u>R15.00</u>.

If not audited, your earnings for the round will be R50 – R15.00 = R35.00

If audited, your earnings for the round will be R50 – R15.00 = R35.00

Example 2: Suppose your income for the round is R50.00, and that you report R30.00 as your income, and the penalty rate is 1.5 times the unpaid tax. Then your tax owed will be 0.30*R50.00 = <u>R15.00</u>; Tax reported will be 0.30*R30 = <u>R9.00</u>.

If not audited, your earnings for the round will be R50 – R9.00 = R41.00

If audited and detected all unreported income of R20.00, (where R20 = R50 – R30), you will be required to pay a fine, which is a multiple of the unpaid tax.

If the penalty is 1.5, your earnings for the round will be R50 – R9.00 – 1.5(R15.00 – R9.00) = R32.00

If the penalty is 3.0, your earnings for the round will be R50 – R9.00 – 3.0(R15.00 – R9.00) = R23.00

You will participate in 10 rounds, but only one round count towards earnings. This is determined by rolling a 10-sided die at the end of the exercise. Thus, all rounds have an equal chance of being selected and no one knows in advance which one will be chosen. Importantly, you will be paid your earnings in cash.

If you have any questions, please your hand and we will come there to assist you.

APPENDIX E: INSTRUCTION SHEETS - VDPs

Instruction sheet for Session 1

This is an experiment about economic decision making. The study will last no more than 1 hour. You will receive R30 for your participation and will have the opportunity to increase this amount based on the decisions you make during the experiment. Your earnings will be paid to you in cash at the end of the experiment. Your decisions and payments will be kept private. How your decisions affect your earnings is explained below.

The decisions made in this experiment are tax reporting decisions. In each round you will earn income, which is randomly assigned to you. In each round, you will have to report your income to a tax authority and pay taxes on reported income. The tax rate is 30%. Thus, your taxes will be 0.30* (reported income).

After you submit your taxes, there is a chance that you will be audited by the tax authority. The probability of an audit will be announced. The audits are determined by a virtual bingo cage that is displayed on the computer screen. The cage contains ten balls, red and white balls. These balls will bounce for a while before one randomly pops out. If a red ball pops out, you will be audited. Conversely, a white ball popping out means that you will not be audited. If audited, there is a 50% chance that the unreported income will be detected. Importantly, the audit will be undertaken for the current round and three previous rounds.

In every round you are offered an opportunity to declare your previous unreported income voluntarily and pay the tax owed and a late-payment penalty, calculated as 25% of the tax paid late. If you do not report your previous unreported income and the unreported income is detected through an audit, you will pay the tax owed and a non-filing penalty, calculated as 50% of the detected taxes.

How your earnings will be determined

If you are not detected for underreporting, your accumulated earnings for the round will be:

Actual income – 0.30* (reported income)

If you are not detected, and you voluntarily declare previously unreported income, your accumulated earnings for the round will be:

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

If you are detected after paying part of your previously unreported income, your accumulated earnings for the round will be:

Actual income – taxes paid – late payment penalty – non-filing penalty

= actual income – 0.30*(reported income) – 0.25*(back taxes declared voluntarily) – (1.5)*0.3*(actual income-reported income)

Examples

These examples will demonstrate the types of decision you will be making and how your earnings will be determined.

Example 1: Suppose your income for the previous round and this round is R50 each and that you report R50 as your income for both rounds. Then you will pay 0.30*R50.00 = **R15.00** in taxes for each round.

If not audited, your accumulated earnings will be R100 – R30.00 = R70.00

If audited, your accumulated earnings will be R100 – R30.00 = R70.00

Example 2: Suppose your income for the previous round and this round is R50 each and that you reported R30 in the previous round, and R40 in the current round. Then your total taxes would be:

0.30(R30 + R40) = R21.00*

If not audited, your accumulated earnings will be:

R100 – R21.00 = R79.00

If audited and detected for underreporting, your accumulated earnings will be:

*R100 – R21.00 – 1.5*0.3*R30 = R65.50*

Example 3: Suppose your income for the previous round and this round is R50 each and that you reported R20 in the previous round, and R70 in the current round, of which R20 is the previous unreported income. Then your total taxes will be:

0.30(R20 + R70) = R27.00*

If not audited, you will only pay additional late-payment penalty on back taxes, which is:

*0.25*0.3*R20 = R1.50*

Your accumulated earnings for the round will therefore be:

100 – R27 – R1.50 = R71.50

If audited and the audit detects all unreported income, which is R10.00; you will be required to pay an additional non-filing penalty of 50% on detected taxes. Your accumulated earnings will therefore be:

R100 – R27 – R1.50 – 0.3(1.5)*R10 = R67.00*

The experiment will have 12 rounds. Your earnings are drawn from all rounds and are converted from laboratory currency (lab Rands) to South African currency (Rands) at the rate of lab R12 = R1. Your payment will be in cash.

If you have any questions, please raise your hand and one of us will come to your desk to answer it.

Instruction for Sessions 2, 3, 4 & 5

This is an experiment about economic decision making. The study will last no more than 1 hour. You will receive R30 for your participation and will have the opportunity to increase this amount based on the decisions you make during the experiment. Your earnings will be paid to you in cash at the end of the experiment. Your decisions and payments will be kept private. How your decisions affect your earnings is explained below.

The decisions made in this experiment are tax reporting decisions. In each round you will earn income, which is randomly assigned. In each round, you will have to report your income to a tax authority and pay taxes on reported income. The tax rate is 30%. Thus, your taxes will be 0.30* (reported income).

After you submit your taxes, there is a chance that you will be audited by the tax authority. The probability of an audit will be announced. The audits are determined by a virtual bingo cage that is displayed on the computer screen. The cage contains ten balls, red and white balls. These balls will bounce for a while before one randomly pops out. If a red ball pops out, you will be audited. Conversely, a white ball popping out means that you will not be audited. If audited, there is a 50% chance that the unreported income will be detected. Importantly, the audit will be undertaken for the current round and three previous rounds.

In every round you are offered an opportunity to declare your previously unreported income, voluntarily and pay the tax owed and a late-payment penalty, calculated as 25% of the tax paid late. If you do not report your previously unreported income and the unreported income is detected through an audit, you will pay the tax owed and a non-filing penalty, calculated as 50% of the detected taxes.

Furthermore, a Voluntary Disclosure Programme (VDP) may be introduced, whereby you are offered an opportunity to voluntarily report your previously unreported and pay the taxes owed but not the late-payment penalty. However, as in the case of a non-VDP regime, if do not voluntarily report the unreported income and the unreported income is detected through an audit, you will pay the taxes owed and the non-filing penalty (which is 50% of the tax owed).

How your earnings will be determined

If you are not detected for underreporting, your accumulated earnings for the round will be:

Actual income – 0.30 (reported income)*

If you are not detected, and you voluntarily declare previously unreported income, your accumulated earnings for the round will be:

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

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If you are detected after paying part of your previously unreported income, your accumulated earnings for the round will be:

Actual income – taxes paid – late payment penalty – non-filing penalty

= actual income – 0.30*(reported income) – 0.25*(back taxes declared voluntarily) – (1.5)*0.3*(actual income-reported income)

If a VDP is introduced and you honestly report your current income and voluntarily disclose all previously unreported income, whether audited or not audited, your earnings will be:

Actual income – 0.30*(reported income).

If a VDP is introduced and the you voluntarily disclose part of the previously unreported income, and you are detected for underreporting, your earnings will be:6

Actual income – 0.30*(reported income) – 0.3*1.5*(actual income – reported income).

Examples

These examples will demonstrate the types of decisions you will be making and how your earnings will be determined.

Example 1: Suppose your income from the previous round and this round is R50 each and that you report R50 as your income for both rounds. Then you will pay 0.30*R50.00 = **R15.00** in taxes in each round.

If not audited, your accumulated earnings will be R100 – R30.00 = R70.00

If audited, your accumulated earnings will be R100 – R30.00 = R70.00

Example 2: Suppose your income from the previous round and this round is R50 each and that you reported R30 in the previous round, and R40 in the current round. Then your total taxes would be:

0.30*(R30 + R40) = R21.00

If not audited, your accumulated earnings will be:

R100 – R21.00 = R79.00

If audited and detected for underreporting, your accumulated earnings will be:

R100 – R21.00 – 1.5*0.3*R30 = R65.50

Example 3: Suppose your income from the previous round and this round is R50 each and that you reported R20 in the previous round, and R70 in the current round, of which R20 is the previously unreported income. Then your total taxes will be:

0.30*(R20 + R70) = R27.00

If not audited, you will only pay the additional late-payment penalty on back taxes, which is:

0.25*0.3*R20 = R1.50

Your accumulated earnings for the round will therefore be:

R100 – R27 – R1.50 = R71.50

If audited and the audit detects all unreported income, which is R10.00; you will be required to pay an additional non-filing penalty of 50% on detected taxes. Your accumulated earnings will therefore be:

R100 – R27 – R1.50 – 0.3*(1.5)*R10 = R67.00

In a VDP regime, the late penalty is suspended.

If you are not audited, your accumulated earnings for the round will be:

R100 – R27 = R73.00

If audited and detected for underreporting in the VDP, your accumulated earnings will be:

R100 – R27 – 0.3*(1.5)*R10 = R65.50

The experiment will have 12 rounds. Your earnings are drawn from all rounds and are converted from laboratory currency (lab Rands) to South African currency (Rands) at the rate of lab R12 = R1. Your payment will be in cash.

If you have any questions, please raise your hand and one of us will come to your desk to answer it.

APPENDIX F: QUESTIONNAIRE

QUESTIONNAIRE

Session No. [ ]   **Computer No.** [ ]

Instructions

Below are several questions relating to your demographic information and experience with tax reporting. These questions may be of a sensitive nature. Although your name will not be matched with your responses in any way and all information provided will be kept strictly confidential, you may be uncomfortable or unable to answer all questions. Please indicate if you prefer not to answer a particular question or if you would like to leave the study at any time. If you choose to answer the questions, please answer them honestly and to the best of your ability.

I. Questions Concerning Your Demographic Information

1. What is your age?

_____years

2. Are you?
- ☐ Male
- ☐ Female

3. Are you?
- ☐ South African
- ☐ Non-South African

4. What is your religious affiliation?
- ☐ Catholic
- ☐ Baptist
- ☐ Protestant (Pentecostal)
- ☐ Muslim
- ☐ Jewish
- ☐ No Religion
- ☐ Don't Know
- ☐ Prefer Not to Answer
- ☐ Other

5. Which of these groups best describes you?
- ☐ White
- ☐ Black
- ☐ Coloured
- ☐ Asian
- ☐ Other
- ☐ Prefer Not to Answer

6. Are you currently working?
- ☐ Yes, I have a full-time job
- ☐ Yes, I have a part-time job
- ☐ Yes, I am self-employed
- ☐ No
- ☐ Prefer Not to Answer

7. What is your year in school now?
- ☐ First year
- ☐ Second year
- ☐ Third year
- ☐ Postgraduate
- ☐ Prefer Not to Answer

8. What is your family's total annual income?
- ☐ Less than R50,000
- ☐ R50,000 to R149,999
- ☐ R150,000 to R249,999
- ☐ R250,000 to R349,999
- ☐ R350,000 to R449,999
- ☐ More than R449,999
- ☐ Prefer Not to Answer

9. What is your current marital status?
- ☐ Never married
- ☐ Married
- ☐ Separated
- ☐ Divorced
- ☐ Widowed
- ☐ Living together but not married
- ☐ Prefer Not to Answer

10. In which Faculty are you registered?
- ☐ EMS
- ☐ Arts
- ☐ Law
- ☐ Engineering
- ☐ Natural Sciences
- ☐ Agriculture
- ☐ Other (specify)_____

11. What is your academic major?
- ☐ Specify_____

II. Questions Concerning Your Experience

11. Have you filed tax return before?
- ☐ Yes
- ☐ No
- ☐ Don't know
- ☐ Prefer Not to Answer

12. Have you participated in an economics experiment previously?

- ☐ Yes
- ☐ No
- ☐ Don't know
- ☐ Prefer Not to Answer

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APPENDIX G: T-TEST RESULTS

Figure G.1: non-salaried compliance rate for session 1

```
. ttest nonsa1== nonsa2 if session ==1

Paired t test
───────────────────────────────────────────────────────────────────────────────
Variable │     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
─────────┼─────────────────────────────────────────────────────────────────────
  nonsa1 │     306    .4911984      .02097    .3668252    .4499342    .5324626
  nonsa2 │     306    .4971163    .0214928    .3759698    .4548234    .5394091
─────────┼─────────────────────────────────────────────────────────────────────
    diff │     306   -.0059179    .0052295    .0914781   -.0162082    .0043725
───────────────────────────────────────────────────────────────────────────────
    mean(diff) = mean(nonsa1 - nonsa2)                          t =  -1.1316
 Ho: mean(diff) = 0                            degrees of freedom =      305

 Ha: mean(diff) < 0              Ha: mean(diff) != 0              Ha: mean(diff) > 0
 Pr(T < t) = 0.1293           Pr(|T| > |t|) = 0.2587           Pr(T > t) = 0.8707
```

Source: Author's own calculations.

Figure G.2: non-salaried compliance rate for session 2

```
. ttest nonsa1== nonsa2 if session ==2

Paired t test
───────────────────────────────────────────────────────────────────────────────
Variable │     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
─────────┼─────────────────────────────────────────────────────────────────────
  nonsa1 │     246    .5362717    .0274397    .4303746    .4822239    .5903194
  nonsa2 │     246    .5326784    .0274034    .4298055    .4787021    .5866548
─────────┼─────────────────────────────────────────────────────────────────────
    diff │     246    .0035932    .0030735     .048206   -.0024606    .0096471
───────────────────────────────────────────────────────────────────────────────
    mean(diff) = mean(nonsa1 - nonsa2)                          t =   1.1691
 Ho: mean(diff) = 0                            degrees of freedom =      245

 Ha: mean(diff) < 0              Ha: mean(diff) != 0              Ha: mean(diff) > 0
 Pr(T < t) = 0.8782           Pr(|T| > |t|) = 0.2435           Pr(T > t) = 0.1218
```

Source: Author's own calculations.

Figure G.3: non-salaried compliance rate for session 3

```
. ttest nonsa1== nonsa2 if session ==3

Paired t test
───────────────────────────────────────────────────────────────────────────────
Variable │     Obs        Mean     Std. Err.    Std. Dev.   [95% Conf. Interval]
─────────┼─────────────────────────────────────────────────────────────────────
 nonsa1  │     300    .4478589    .0205497    .3559321    .4074184    .4882993
 nonsa2  │     300    .4475804    .0205212    .3554377    .4071961    .4879647
─────────┼─────────────────────────────────────────────────────────────────────
   diff  │     300    .0002784    .0023379    .0404934   -.0043224    .0048792
───────────────────────────────────────────────────────────────────────────────
    mean(diff) = mean(nonsa1 - nonsa2)                            t =    0.1191
 Ho: mean(diff) = 0                              degrees of freedom =       299

 Ha: mean(diff) < 0              Ha: mean(diff) != 0              Ha: mean(diff) > 0
 Pr(T < t) = 0.5474          Pr(|T| > |t|) = 0.9053          Pr(T > t) = 0.4526
```

Source: Author's own calculations.

Figure G.4: Salaried compliance rate for session 1

```
. ttest sal1== sal2 if session== 1

Paired t test
───────────────────────────────────────────────────────────────────────────────
Variable │     Obs        Mean     Std. Err.    Std. Dev.   [95% Conf. Interval]
─────────┼─────────────────────────────────────────────────────────────────────
  sal1   │     305    .7776269    .0180719    .3156129    .7420649    .8131888
  sal2   │     305    .7775488    .0180759    .3156823     .741979    .8131185
─────────┼─────────────────────────────────────────────────────────────────────
   diff  │     305    .0000781    .0000624    .0010897   -.0000447    .0002008
───────────────────────────────────────────────────────────────────────────────
    mean(diff) = mean(sal1 - sal2)                               t =    1.2512
 Ho: mean(diff) = 0                              degrees of freedom =       304

 Ha: mean(diff) < 0              Ha: mean(diff) != 0              Ha: mean(diff) > 0
 Pr(T < t) = 0.8941          Pr(|T| > |t|) = 0.2118          Pr(T > t) = 0.1059
```

Source: Author's own calculations.

Figure G.5: Salaried compliance rate for session 2

```
. ttest sal1== sal2 if session== 2

Paired t test
─────────────────────────────────────────────────────────────────────────────
Variable │     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
─────────┼───────────────────────────────────────────────────────────────────
    sal1 │     243    .6605624    .0271904    .4238572    .6070023    .7141226
    sal2 │     243    .6598256    .0272288    .4244552    .6061899    .7134613
─────────┼───────────────────────────────────────────────────────────────────
    diff │     243    .0007368    .0004896    .0076315   -.0002275    .0017012
─────────────────────────────────────────────────────────────────────────────
    mean(diff) = mean(sal1 - sal2)                            t =    1.5051
 Ho: mean(diff) = 0                          degrees of freedom =       242

 Ha: mean(diff) < 0             Ha: mean(diff) != 0           Ha: mean(diff) > 0
 Pr(T < t) = 0.9332          Pr(|T| > |t|) = 0.1336           Pr(T > t) = 0.0668
```

Source: Author's own calculations.

Figure G.6: Salaried compliance rate for session 3

```
. ttest sal1== sal2 if session== 3

Paired t test
─────────────────────────────────────────────────────────────────────────────
Variable │     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
─────────┼───────────────────────────────────────────────────────────────────
    sal1 │     298    .6739214    .0222333    .3838063    .6301666    .7176762
    sal2 │     298     .673418    .0222904    .3847915    .6295509    .7172851
─────────┼───────────────────────────────────────────────────────────────────
    diff │     298    .0005034    .0008412    .0145214   -.0011521    .0021588
─────────────────────────────────────────────────────────────────────────────
    mean(diff) = mean(sal1 - sal2)                            t =    0.5984
 Ho: mean(diff) = 0                          degrees of freedom =       297

 Ha: mean(diff) < 0             Ha: mean(diff) != 0           Ha: mean(diff) > 0
 Pr(T < t) = 0.7250          Pr(|T| > |t|) = 0.5500           Pr(T > t) = 0.2750
```

Source: Author's own calculations.

APPENDIX H: HAUSMAN AND BREUSCH-PAGAN LM TESTS

Figure H.1: Hausman test results on non-salaried income compliance rate

```
. hausman fixed random

                    ———— Coefficients ————
                     (b)          (B)          (b-B)       sqrt(diag(V_b-V_B))
                    fixed        random       Difference          S.E.

 totalincome      -.0004566    -.0004709       .0000143           .0000165
30.auditrate       .4228648     .4189833       .0038816           .0042033
300.penalt~e       .2142929     .2133508       .000942            .0041481
1.prevaudit1       .1241896     .1246546      -.000465            .0016668
1.prevaudit2       .0261933     .026468       -.0002747           .001822
1.prevaudit3       .0124897     .0126163      -.0001266           .0020063
1.prevaudit4      -.0214224    -.0211971      -.0002253           .0022583
1.prevaudit5      -.0061901    -.0064529       .0002628           .0020752
1.prevaudit6       .0094443     .0089791       .0004652           .0020402
1.prevaudit7       .0121564     .0122172      -.0000608           .0021378
1.prevaudit8       .0021158     .0021159      -8.94e-08           .0021036
1.prevaudit9       .0038209     .0037869       .0000341           .0021942
       round
           2      -.0091568    -.0087296      -.0004273           .0015093
           3      -.0316894    -.0311027      -.0005867           .0015862
           4      -.0463777    -.0457759      -.0006018           .0015696
           5      -.0858081    -.0851331      -.000675            .0016077
           6      -.1667939    -.1639571      -.0028368           .0028521
           7      -.1589935    -.1562616      -.0027319           .0028239
           8      -.1757183    -.1731146      -.0026037           .0028052
           9      -.1844755    -.1818765      -.002599            .0027946
          10      -.1703325    -.1672236      -.0031089           .002905
  nonsalshare     -.1485957    -.1454996      -.003096            .0074587
   auditrate#
   penaltyrate
     30 300        -.06569     -.0646346      -.0010554           .0060058

                        b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

            chi2(23) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                     =        2.92
            Prob>chi2 =       1.0000
```

Source: Author's own calculations.

Figure H.2: Breusch-Pagan Lagrangian multiplier test on non-salaried compliance rate

```
Breusch and Pagan Lagrangian multiplier test for random effects

        nonsalcomprate[taxpayer,t] = Xb + u[taxpayer] + e[taxpayer,t]

        Estimated results:
                         |       Var      sd = sqrt(Var)
                ─────────┼──────────────────────────────
                nonsalc~e|    .1490351        .3860507
                       e |    .0326047        .1805676
                       u |    .0931558        .3052144

        Test:   Var(u) = 0
                              chibar2(01) =   3552.69
                            Prob > chibar2 =    0.0000
```

Source: Author's own calculations.

Figure H.3: Hausman test results on salaried income compliance rate

```
. hausman fixed random

                 ──── Coefficients ────
                    (b)          (B)          (b-B)      sqrt(diag(V_b-V_B))
                   fixed       random      Difference          S.E.
    ─────────────┼──────────────────────────────────────────────────────────
     totalincome |  -.0002812    -.0003021     .0000209        .0000142
    30.auditrate |   .3051286     .2967642     .0083645        .0042224
    300.penalt~e |   .1708159     .1628952     .0079207        .0041387
    1.prevaudit1 |   .1058824     .1052692     .0006132        .0014486
    1.prevaudit2 |   .0301938     .0291051     .0010888        .0016586
    1.prevaudit3 |   .0031779     .0021445     .0010334        .0018958
    1.prevaudit4 |   -.008404     -.009618      .001214        .0022077
    1.prevaudit5 |  -.0150503    -.0163447     .0012944         .001974
    1.prevaudit6 |   .0024151     .0012604     .0011547        .0019171
    1.prevaudit7 |   .0335142     .0325092      .001005        .0020629
    1.prevaudit8 |   .0434595     .0425054     .0009541        .0020068
    1.prevaudit9 |   .0235536     .0222669     .0012867        .0021131
           round |
               2 |  -.0068226    -.0063436      -.000479        .0002697
               3 |  -.0040385     -.003294     -.0007445         .000538
               4 |  -.0284863    -.0277701     -.0007163         .000483
               5 |  -.0395303    -.0387402     -.0007901        .0006533
               6 |  -.0956155    -.0901992     -.0054163        .0024078
               7 |  -.1192797    -.1140493     -.0052304        .0023819
               8 |  -.1107302    -.1056109     -.0051193        .0023671
               9 |  -.0993602    -.0942762      -.005084        .0023523
              10 |  -.1064247    -.1010189     -.0054058        .0024954
      nonsalshare |   .1975124     .2029864      -.005474        .0071277
      auditrate# |
      penaltyrate |
           30 300 |  -.1625979    -.1483467     -.0142512        .0060298

                      b = consistent under Ho and Ha; obtained from xtreg
          B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(23) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                           =    3.28
                Prob>chi2 =      1.0000
                  (V_b-V_B is not positive definite)
```

Source: Author's own calculations.

Figure H.4: Breusch-Pagan Lagrangian multiplier test on salaried income compliance rate

```
Breusch and Pagan Lagrangian multiplier test for random effects

      salcomprate[taxpayer,t] = Xb + u[taxpayer] + e[taxpayer,t]

    Estimated results:
                       |        Var      sd = sqrt(Var)
                 _____|_____
          salcomp~e    |    .1216083         .3487237
                 e     |    .0318092         .1783512
                 u     |    .0713209         .2670598

    Test:    Var(u) = 0
                          chibar2(01) =   3054.97
                       Prob > chibar2 =    0.0000
```

Source: Author's own calculations.

Figure H.5: Hausman test results on overall compliance rate

```
. hausman fixed random
```

	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
totalincome	-.0003291	-.0003439	.0000148	.0000122
30.auditrate	.370668	.3663371	.0043309	.0031706
300.penalt~e	.1950522	.1919447	.0031075	.0031242
1.prevaudit1	.1151789	.1151416	.0000373	.0012411
1.prevaudit2	.0238097	.0235148	.0002949	.0013631
1.prevaudit3	.0088879	.0085574	.0003305	.0015066
1.prevaudit4	-.0143422	-.0147471	.0004049	.0017023
1.prevaudit5	-.0118937	-.0125057	.000612	.0015603
1.prevaudit6	.0039913	.003286	.0007052	.0015333
1.prevaudit7	.0261794	.0257775	.0004019	.0016094
1.prevaudit8	.0238999	.0234957	.0004043	.0015819
1.prevaudit9	.0178674	.0173325	.0005348	.0016515
round				
2	-.0118357	-.0114081	-.0004275	.0010748
3	-.0223616	-.0217577	-.0006039	.0011359
4	-.0402995	-.0396957	-.0006039	.0011227
5	-.0712977	-.0706106	-.0006871	.0011532
6	-.1362763	-.1331115	-.0031647	.0021144
7	-.1445894	-.1415038	-.0030856	.0020931
8	-.1479528	-.1449704	-.0029824	.0020795
9	-.1478346	-.1448751	-.0029595	.0020714
10	-.1443503	-.1410596	-.0032907	.0021593
nonsalshare	-.2341917	-.2307372	-.0034546	.0055417
auditrate# penaltyrate				
30 300	-.1098864	-.1051254	-.004761	.0045266

```
                    b = consistent under Ho and Ha; obtained from xtreg
         B = inconsistent under Ha, efficient under Ho; obtained from xtreg

   Test:  Ho:  difference in coefficients not systematic

         chi2(23) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                  =      4.25
         Prob>chi2 =      1.0000
```

Source: Author's own calculations.

Figure H.6: Breusch-Pagan Lagrangian multiplier test on overall compliance rate

```
Breusch and Pagan Lagrangian multiplier test for random effects

        overallcomprate[taxpayer,t] = Xb + u[taxpayer] + e[taxpayer,t]

        Estimated results:
                                Var      sd = sqrt(Var)
                     _____
             overall~e │     .1151434         .3393278
                     e │     .0218292          .147747
                     u │     .0723366         .2689546

        Test:   Var(u) = 0
                            chibar2(01) =   3932.93
                           Prob > chibar2 =    0.0000
```

Source: Author's own calculations.

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