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Assessing Taxpayer Compliance Risk Identification Criteria at the Kenya Revenue Authority

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Abstract

This exploratory study analyzed the taxpayer compliance function at the Kenya Revenue Authority (KRA). The objectives of the study were three-fold. The first was to develop a regression model for taxpayer compliance risk management. The second objective was to identify determinants of taxpayer compliance risk while the third objective was to assess the effectiveness of the current risk profiling frameworks used by the revenue departments. The literature reviewed pointed at six categories of factors that determine taxpayer compliance. These are economic, social, psychological, demographic, institutional and political factors. These factors were further categorized into five areas that could be easily captured for regression purposes. These are cultural and behavioral factors, control process for complex transactions, financial performance, history of taxpayer compliance and erratic factors. A binary logistic regression model was specified where the dependent variable was a measure of payment compliance. The independent variables were also categorical in nature. The data used were obtained from the Large Taxpayers Office database covering the period 2009/10 to 2011/12. The results showed that the model was well specified and had an overall percentage of prediction of 77%. This was further supported by the goodness of fit as measured by the Hosmer and Lemeshow statistic and the pseudo R-squared by Nagelkerke. The variable selection procedure was stepwise forward selection (Wald). The results show that nine variables were significant namely: business ownership, characteristics of tax agents, performance targets, erratic performance of the sector, nature of business, financial performance of the taxpayer in terms of profitability and liquidity, company structure and frequency of investment deduction claims. This implies that cultural and behavioral factors, control of complex transactions, financial performance, history of taxpayer compliance and erratic factors are significant determinants of payment compliance. The model is recommended for taxpayer profiling based on the characteristics found to be significant determinants of taxpayer compliance. Whereas the study does not recommend a replacement of the current risk profiling frameworks used by revenue departments, it is recommended that more weight should be placed on the areas that were found to be significant in determining taxpayer compliance. It is further recommended that KRA needs to maintain a more extensive and systematic taxpayer database that permits a more effective risk assessment. This data base would go a long way in ensuring a more effective and transparent tax administration.

JEL Classification Numbers: H20, H26, H83

Keywords: Tax compliance, compliance model, risk management

1.0 Introduction

In a modern revenue administration, tax payment is based on taxpayer self-assessment and voluntary compliance. Hence the main focus of a modern revenue administration is to manage tax compliance so that delinquent behavior can be detected and prevented, and at the same time to

provide taxpayer service and education to enable taxpayers fulfil their tax obligations easily with least complexity and compliance burden (Khwaja 2011).

Tax compliance broadly means fulfilling tax obligations in accordance with tax laws and accounting practices without the application of enforcement activity (James and Alley 2002 and Braithwaite and Wirth 2001). Tax compliance therefore concerns, registration, filing, reporting and payment of taxes. Compliance is therefore assessed on the four aspects of taxation namely, correct and complete registration as a taxpayer, timely and full filing of tax returns with the tax authority, timely and complete reporting of tax obligations and timely and full payment of taxes to the tax authority. Registration compliance measures the proportion of taxpayers registered with the tax authority. Filing compliance refers to the proportion of registered taxpayers that submit tax returns to the tax authority. Reporting compliance refers to the accuracy of taxable income information. Finally payment compliance refers to the proportion of taxes paid by the deadline.

There is a growing concern among revenue authorities across the world that a lot of revenue is lost due to noncompliance on the part of taxpayers. Revenue authorities lose large amounts of tax revenue due to taxpayer noncompliance. Domestic revenue mobilization therefore calls for enhanced compliance with registration, filing, reporting and payment of taxes. According to the Organization for Economic Co-operation and Development (OECD), a compliance risk management process is a structured process for the systematic identification, assessment, ranking and treatment of tax compliance risks. The risks include failure to register, failure to properly report tax liabilities, failure to file tax returns and failure to make tax payments. The model, which is applied by various revenue authorities in Europe, involves establishing the operating context, identification of risks, assessing and prioritizing risks, assessing compliance behavior of taxpayers and determining the treatment strategies.

1.1 Compliance Risk Management at KRA

The Authority has various strategies in place to enhance taxpayer compliance. The strategies are hinged to the institutional arrangement of the Authority together with its role in the region. The revenue departments comprising the Large Taxpayers Office, Medium and Small Taxpayers Department and Customs Services Department have separate sections that deal with compliance

risk management. The Investigations and Enforcement Department has an enforcement strategy in place that they use to profile taxpayers and identify cases for audit.

1.2.1 Audit Office

The revenue departments have Audit Offices which carry out taxpayer risk profiling and identification of audit cases. They use a risk identification framework that profiles taxpayers according to their risk scores. There are group risks which basically relate to the sector in which the taxpayer falls and individual risks which relate to individual behavior of the taxpayer. The individual risks are graded up to 70% of the total risk scores while group risks account for the remaining 30%. Taxpayers are then ranked according to their overall risk scores and those with the highest percentage scores are selected for possible audit after discussions at the departmental level.

This risk identification framework is broadly used by the domestic revenue departments of the Large Taxpayers Office and the Medium and Small Taxpayers Department. The Customs Services Department carries out its compliance risk management services through the established office of the National Targeting Centre as explained below.

1.2.2 The National Targeting Centre

This unit carries out a comprehensive risk analysis, profiling and targeting for taxpayers that fall under the Customs Services Department. It has a policy document that contains the risk criteria and procedures used for overall risk management. There are Risk Analysis Units established at the stations to undertaken actual risk analysis before goods are released.

The Simba system enables categorization of risks as recommended by the World Customs Organization. Entries are categorized into three channels for customs goods clearance based on anticipated risks. Entries from high risk clearing agents use the red channel where their goods are subjected to a substantial inspection. Those with moderate risk use the yellow channel and their goods are subjected to a modest inspection. The green channel is reserved for authorized economic operators who are considered less risky and supported with a history of minimal or no risk at all. In all channels, once goods have been cleared, the process can still be subjected to a post clearance audit. This is carried out by the post clearance audit unit within the department.

1.2.3 Enforcement Strategy

The goal of the Authority during the third Corporate Plan period 2006/07-2008/09 was to enhance revenue collection through strengthening of enforcement. During the fourth Corporate Plan period 2009/10-2011/12 the Authority prepared an Enforcement Strategy Paper which aimed at consolidating all the enforcement efforts into a single KRA-wide Enforcement Strategy with the objective of ensuring consistency in policy and enhancing a coordinated approach to enforcement. This involved revenue departments identifying and documenting all the risk areas together with proposed mitigation strategies. The strategy deals with non-compliance in the four areas of registration, filing, reporting and payment. The main aim of the enforcement strategy is to provide mechanisms for a proactive approach to detecting and responding to cases of non-compliance.

The Enforcement Strategy identifies main reasons why taxpayers fail to comply. These include lack of knowledge, low risk of detection, confusion, poor record keeping, differing legal interpretations, unexpected personal emergencies, temporary cash flow problems, high cost of compliance and willful non-compliance (KRA 2008). Strategies are in place to deal with these causes of non-compliance.

1.2.4 The Regional Intelligence Liaison Office (RILO)

This is a World Customs Organization institution set up to gather, analyze and exchange intelligence information under the World Customs Organization enforcement strategy. The main RILO information gathered and exchanged relates to customs seizures and offences, and information and intelligence needs of customs services across the world. The intelligence information provided by RILO helps in defining risk indicators, smuggling trends, means of transportation and means of concealment. Sharing of this strategic information helps the revenue authorities to update their compliance risk management strategies as well as combating transnational crimes.

1.2 Weakness in the KRA's compliance management framework

The compliance management framework at the Authority falls within the wider enterprise risk management framework that deals with both external and internal risks. The main challenge in the taxpayer compliance risk identification is that every revenue department has its own risk analysis and profiling framework. In some instances the framework is not documented. The risks are

identified based on sector segmentation of taxpayers with individual risks being allocated higher weights compared to sector-specific risks. In the Customs Services Department taxpayers are classified based on their compliance status. Highly compliant ones are categorized as authorized economic operators and their entries are channeled through the green channel. In some cases, risk identification and audit selection is not based on a scientifically proven criterion although it could be argued that weighting of risks is based on expert discussions and consensus. The risk identification criteria are not automated and risk profiling has to be done regularly with huge data requirements.

1.3 Statement of the Problem

The Kenya Revenue Authority identifies non-compliance key risk areas and seeks to address them in its enforcement strategy paper. The main risks include reduced revenue yield brought about by failure to register, failure to file, failure to pay and failure to report. Reduction in the revenue yield related to registration is occasioned by registering ineligible taxpayers, retaining taxpayers on the register when their eligibility ceases or those that fulfil the requirements to register fail to do so or have incorrect information maintained on the register.

Risks to revenue yield as a result of failure to file is occasioned by taxpayers not filing their returns on time. Risk attributed to payment involves failure by the taxpayer to remit taxes and failure by a tax agent to remit withheld taxes collected by the agent on behalf of the Authority. Risk to revenue yield associated with failure to report includes declaring incorrect amount of tax on the tax return either by error or deliberately. This includes concealment of taxable assets or income, misuse of exempt transactions and use of fraudulent documents to claim undue refunds, remissions or exemptions.

The Authority has a framework for identifying and addressing compliance risks. However, the framework needs to be assessed in terms of its accuracy in correctly identifying cases for audit. This therefore calls for the development of a scientific criterion for compliance risk profile analysis.

1.4 Objectives of the study

This study seeks to come up with a compliance risk identification criterion that will help the Authority in mitigating risks to revenue yield. The main objective of this study is to develop a taxpayer compliance risk model for the country. The following are the specific objectives:

i) Develop a compliance risk model for Kenya
ii) Identify determinants of taxpayer compliance risk
iii) Assess the effectiveness of the current compliance risk framework
iv) Provide recommendations for addressing compliance risks.

1.0 Literature Review

2.1 Theoretical Review

This section discusses theories that have been put forward to explain taxpayer behavior with regard to tax compliance.

It is important to understand the compliance behavior of taxpayers so as to inform the treatment strategy to use. Empirical studies have established that compliance behavior could be explained by both economic and non-economic factors. Noncompliance by taxpayers may depend on age, level of education, moral obligation, gender, industry, personality, circumstances, the perceived cost of compliance and assessment of the risk involved (OECD, 2004a).

Allingham and Sandmo (1972) developed a model to explain income tax evasion. The model implied that rational individuals whose income is not subjected to third party sources of information would not report any income at all for tax purposes. The individual will therefore decide to evade taxes based on the tax rate, penalty rate, government expenditure on investigations and probability of being detected which eventually determine the net benefits of evasion. This theoretical finding elucidated substantial interest which later showed that tax compliance behavior among taxpayers could not be explained using the economics-of-crime model alone.

Sandmo (2004) demonstrates that there are individuals who would not evade paying taxes even when there were opportunities for evasion. This therefore provides an empirical puzzle especially with regard to firms. However, the study reveals that firms whose management is separate from

shareholding (control) would accommodate their taxes in the firm's expenses hence no need for evasion. It further states that individuals will not evade tax due to social and moral considerations. This therefore shows that tax compliance would be explained by factors beyond economic theory of rationality.

Vellutini (2011) summaries the theoretical literature on tax compliance. He states that the study of taxpayer compliance is based on the classical assumption of maximizing expected utility. Hence a taxpayer will not pay taxes as long as the cost of compliance (amount of taxes to be paid and time and resources used in order to comply) exceeds the net benefits of non-compliance. Other studies have extended the analysis to include the role of the tax administration hence using the results of the principal-agent theory under asymmetric information to analyze tax compliance in the context of game theory. This theory takes into account the fact that the probability of detecting taxpayer non-compliance is not exogenous but determined by the information provided by taxpayers when they file their tax returns. The tax administration therefore knows that the income reported by taxpayers depends on their actions. Hence the tax administration will seek to maximize expected tax and penalty revenues net of audit and enforcement costs subject to their budget constraint. The result of this game therefore is a compliance strategy for taxpayers and an audit strategy for the tax administration. This theory therefore sets the ground for devising a risk-based audit strategy which is cost-effective compared to other methods of audit case selection.

Vellutini (2011) states that tax compliance depends on various psychological and behavioral factors. These factors include individual-specific ones such as gender, age and education, attributes of a firm's manager, and firm factors such as type of industry it belongs, firm size and financial situation. The second set of factors include the perceived fairness of the taxation system in terms of the level of taxes to pay, individual treatment by the tax administration and use of public funds by the government. The last category of factors relate to the perceived compliance in the country. Where non-compliance is prevalent, taxpayers will have a strong incentive not to comply. On the other hand, where compliance is the norm, taxpayers will easily comply for fear of being seen as dishonest and because of the high probability of being detected.

Klepper and Nagin (1989) state that tax compliance is hinged on the probability of detecting noncompliance among tax items and the probability of the detected noncompliance resulting into

prosecution. If the perceived probability of detecting noncompliance is high, then taxpayers will tend to comply. If the perceived probability of being prosecuted in case of noncompliance is high, then taxpayers will tend to comply.

Yaniv (1998) states that there are two theories of tax compliance namely expected utility theory and prospect theory. Expected utility theory is where the taxpayer makes a decision not to comply based on the cost-benefit decision of non-compliance. The taxpayer therefore assesses the benefits versus the costs of noncompliance and where benefits of evasion are greater than the costs of being detected and penalized, he chooses to evade thereby increasing noncompliance.

On the other hand, the prospect theory mainly applies to advance tax where a taxpayer will be risk averse if the advance paid is higher than the true tax liability and thereby expect a gain in form of a refund at the time of filing a return. The taxpayer will on the other hand be risk-taking when the tax advance paid is lower than the true tax liability to be settled when filing a return. Tax compliance will therefore increase if the advance tax is set slightly higher than the true tax liability.

Kornhauser (2007) adds that the prospect theory explains how people evaluate risk. People will be risk averse in regard to gains but risk seeking in regard to loss. Hence a taxpayer will be more willing to take risks (not comply) when an issue is framed as a loss (such as audit penalty) than as a gain (a bonus from a refund). The point here is that a taxpayer's decision to comply or not will depend on how the information is framed and communicated to imply either a gain or loss.

Fjeldstad et al (2012) discusses five theories of taxpayer behavior in relation to tax compliance. These are economic deterrence, fiscal exchange, social influences, comparative treatment and political legitimacy. The economic deterrence revolves around the cost-benefit analysis of tax evasion. The taxpayer's behavior is therefore influenced by the tax rate, probability of detection and penalties for fraud. A low tax rate, higher probability of detection and severe penalties deter taxpayers from evading and thus increasing tax compliance.

The fiscal exchange theory states that tax compliance will increase if taxpayers are able to see and relate government expenditure to the taxes they pay. Government expenditure in terms of efficient and accessible public service delivery will motivate taxpayers to increase compliance. Payment of taxes and government provision of goods and services preferred by citizens would be interpreted

as a contractual relationship between taxpayers and the government hence increasing taxpayer compliance.

The theory of social influences is based on the herd behavior where members of a certain social group will comply when they perceive others to be complying. Taxpayers will comply if they perceive other people in their reference groups such as friends, neighbors and relatives to be complying. Taxpayers will also comply when they know that there are social sanctions imposed for non-compliance.

Comparative treatment is based on the equity theory where taxpayers comply if they perceive fair and equal treatment from the state. People will also comply with rules if they perceive the system that creates them to be impartial. Thus the state's legitimacy and impartiality tends to earn people's trust and thereby contribute towards increasing taxpayer compliance.

The political legitimacy theory states that political institutions with a higher level of legitimacy lead to higher tax compliance. This implies that when people trust institutions such as the revenue authority, then tax compliance will increase.

2.2 Empirical Review

Braithwaite, Reinhart and Smart (2007) investigated tax non-compliance among the under 30s of Australia using a logistic regression model. The study sought to examine whether lack of knowledge, less moral obligation or greater skepticism of government authority explained the lower compliance among younger taxpayers. The study used survey findings on 1,528 respondents from a stratified random sample comprising 201 respondents aged under 30 years, 934 respondents in the middle-aged group (between 30 and 55 years) and 393 respondents in the older group (older than 55 years). The findings show that younger taxpayers are more likely to self-report tax evasion than the middle-aged or older taxpayers. Lack of knowledge did not explain tax non-compliance among young people. However, lower levels of moral obligation and less fear of being caught were found to explain the non-compliance among the young taxpayers. Further, it was found that indirectly, lack of knowledge contributed to the low compliance among young taxpayers through linking age to moral obligation.

OECD (2004b) outlines three methods of selecting cases for audit. These include the use of discriminant functional analysis, data mining techniques and the use of large scale data matching techniques. Discriminant functional analysis is used mainly in the USA to predict that certain classes of tax return fall into 'high' or 'low' risk categories. Data mining techniques are used to identify past patterns of non-compliance and to identify those characteristics into the present population. Data matching techniques are applied on large data sets to bring out disparities in tax return data.

Torgler (2002) argues that while the probability of penalty, fine rate and taxpayer's risk aversion play a role in determining tax compliance, there are other social and institutional factors that are also important in determining tax compliance. He argues that if individuals view tax evasion as immoral, then they will strive to comply. Secondly if moral appeals are made to taxpayers, they tend to increase their tax compliance. Thirdly, taxpayers who keep tax evaders as friends have a higher probability of themselves evading taxes and thereby reducing compliance. Finally he argues that societies with stronger social cohesion have higher tax compliance rates.

Torgler (2002 and 2003) further argue that tax compliance is also influenced by tax institutions and government behavior. It is argued that positive inducements such as reward system could be more important in raising tax compliance than the use of penalties. Also perceived equitable utilization of resources by government helps to increase tax compliance. In societies where taxpayers perceive their government as having equitably used revenue increases taxpayer compliance. Taxpayer satisfaction from government provision of public services increases tax compliance. Further, tax compliance is enhanced when citizens perceive that government expenditure is geared towards projects they identify with.

Torgler (2003) argues that tax practitioners also play an important role in tax compliance. A taxpayer who engages a tax practitioner is more likely to comply than one who does not. The study further categorizes taxpayers into four namely social, intrinsic, and honest and evader taxpayers. A social taxpayer is influenced by social norms regarding tax compliance. Such a taxpayer will comply based on the belief that it is moral to pay taxes and will feel guilty and shameful if found not to comply. An intrinsic taxpayer will always feel obliged to pay taxes and comply without being forced or coerced. An honest taxpayer will always comply and will not even attempt to

search for ways to evade or cheat on tax. Finally a tax evader will react to changes in the tax rates and making choices based on the expected benefits of cheating versus expected consequences and probability of detection.

Torgler (2003) used an ordered probit model to analyze tax morale in the US using data collected from the Tax Opinion Survey of 1987. Tax morale is a proxy for tax evasion. Tax evasion is measured in two ways namely over-deduction of expenses or under-declaration of income. He finds that female, married and full-time employed people have a higher probability of tax compliance than male, sing and self-employed people. However the education variable was not statistically significant.

Yaniv (1998) tests the expected utility theory and finds no relationship between advance tax payments and the taxpayer's evasion decision. However, using taxpayer's behavior to conform to prospect theory assumptions, he finds that whereas advance tax set higher than the true tax liability increases tax compliance as taxpayers would expect a gain in tax refund when filing returns, it does not completely eliminate prospects of tax evasion. This means that obligatory advance tax cannot be set too high to eliminate detection efforts. Hence detection efforts must still be set sufficiently high to reduce tax evasion. He further finds out that as long as a taxpayer expects a refund, an increase in the income tax rate will unambiguously lead to an increase in tax evasion and thereby reduce compliance.

Pritchard and Khan (2005) develop a logistic regression model and uses it to empirically test the relationship between taxpayers personal attributes and their non-compliance behavior. The model is applied to 314 United Kingdom taxpayers who hold offshore accounts. Among the attributes used in the model include whether the individual is self-employed, a partner in a business, a director of a company and whether the individual operates in an industry with a high volume of cash transactions. Results show that the taxpayer's age, profession/type of business, annual income and location of residence are significant determinants in taxpayer non-compliance. Taxpayers aged between 60 and 70 years are more likely to generate a high yield from an offshore tax avoidance investigation. A self-employed or partner in a business is more likely to evade tax as well as businesses that have huge volumes of cash transactions.

Kornhauser (2007) presents a detailed theoretical and empirical literature on tax compliance. She notes that tax compliance as measured by tax morale (attitude and belief) depends on economic (income, tax rate and penalty), psychological, social (integrity, equity, reciprocity and conformity) and demographic (age, gender, education and marital status) factors. Also external factors such as rewards and communication frames could influence people's tax compliance by either crowding in or crowding out their internal motivation factors for compliance.

The literature reviewed shows that tax compliance is premised on economic theory as well as other factors outside the realm of economics. These include social, psychological and demographic factors. The empirical literature has reviewed how theories of compliance risk have been tested. Most literature reports laboratory experiments on testing tax compliance. The experiments and surveys have mainly involved compliance of individual tax payers. The studies have mainly used logistic regression models to carry out the analyses.

2.3 Summary

The literature reviewed above identifies five theories that explain tax compliance among taxpayers. These are economic deterrence, fiscal exchange, social influences, comparative treatment and political legitimacy. The theories therefore imply that tax compliance is hinged on economic, social, psychological, demographic, institutional and political factors.

2.0 Methodology

3.1 Analytical techniques for taxpayer risk identification

There are various techniques used to identify risky taxpayers. These include parametric as well as non-parametric methods. Parametric methods include linear regression, logistic regression and discriminant analysis. Non-parametric techniques include data mining.

Data matching is the basic technique used by revenue administrations to identify risky taxpayers. Data matching involves a large scale comparison of records or files which are collected or held for different purposes with a view to identifying matters of interest. It involves checking the consistency of data in tax returns against other independent data sources such as customs, bank and insurance company records, as well as other taxpayers' tax returns

Parametric techniques are widely used by revenue administrations and include regression analysis (both linear and logistic) and discriminant analysis. Discriminant analysis is used to predict categorical outcomes such as taxpayer noncompliance as well as estimating parameters. The distinctive feature of this method is that the dependent variable is defined directly as a score and not a as a probability. The method is prevalently used by the USA's Internal Revenue Service.

Non-parametric analysis does not make any prior model specification but delves in data mining to identify patterns of taxpayer noncompliance and comes up with a list of potential explanatory variables for a given predicted variable. This is becoming a popular method with the increase in the use of information technology and the growing availability of large data sets. Data mining is a set of automated techniques used to extract buried or previously unknown pieces of information from large databases. Data mining has largely been used in businesses to identify groups of customers and market segmentation, in banking and insurance to select clients, in epidemiology to identify groups at risk as a result of their behavior, and in tax administrations to guide audit strategies.

3.2 Developing the model

The empirical literature has shown that some studies use logistic regression models to assess tax compliance. However, most studies have relied on laboratory experiments to analyze tax compliance among individual tax payers due to data constraints. In this study, we use a logistic regression model to assess the determinants of tax compliance among various categories of tax payers using actual data from the KRA database.

We first develop a risk profile of all taxpayers who experienced a compliance action over the period 2009/10 – 2011/12 as well as a sample of taxpayers that have not undergone any compliance action. This involves collection of data on attributes of sampled taxpayers that are likely to explain non-compliance. The analysis will enable us identify attributes of high risk cases for regular surveillance to reduce noncompliance.

3.3 Conceptual Framework of the Logistic Regression Model

This study seeks to test the relationship between taxpayers' attributes and non-compliance. This is to be achieved through the use of logistic regression models to analyze non-compliance.

A logistic model is used to analyze factors that might determine whether or not an outcome happens. The main distinction of the logistic model is that the dependent variable is binary. The model is therefore suitable for analyzing tax compliance where a taxpayer is treated as either compliant or not. In this case we use a logistic regression model to predict the outcome based on a set of independent variables which include both continuous and discrete. A logistic regression model provides the odds ratios for each of the explanatory variables. The dependent variable enters the model as the log of the odds that a taxpayer will be noncompliant.

Since the dependent variable is not continuous we cannot use a linear regression model for our analysis but instead use a suitable non-linear estimation model for estimation. The use of logistic regression is preferred in this kind of study where the dependent variable is categorical. This is because ordinary least squares regression which is based on the assumption of normal distribution of residual errors does not hold in the case of a categorical dependent variable. Secondly, it is the probability of the responses of either yes or no that we are interested in modelling. It is also noted that logistic regression does not assume a linear relationship between the dependent and independent variables, does not require variables to be normally distributed and does not assume homoscedasticity. This means that a logistic regression has less stringent requirements compared to an ordinary least squares regression (Pritchard and khan 2005).

A logistic regression model has a link function that is used to connect the actual dependent variable to the estimated dependent variable. The link function transforms a dichotomous dependent variable into a continuous variable. As a starting point, assume we have our function specified in (1) below and Y is a dichotomous variable.

$$Y = X \propto +\mu \qquad 1$$

Where $Y \in \{0,1\}$

Estimation of equation (1) using a linear regression model will yield wrong results since the dependent variable is not continuous. Equation (1) can therefore be transformed using a link function F(Y) that makes the dependent variable continuous as shown in equation (2) below.

$$F(Y) = Y' = X\beta + \varepsilon \qquad 2$$

Where $Y' \in (-\infty, \infty)$

Equation (2) above therefore shows that the transformed dependent variable Y' can take on any number unlike the original dependent variable Y which only takes on either 0 or 1. It is noted that the transformation from Y to Y' maintains the original relationship between the dependent and explanatory variables. After regressing Y' on independent variables (X), one can still get back to the original values of Y.

The logistic regression model can be used to establish attributes that are useful in predicting a certain outcome. The data can then be used on new cases to compute the probability of a given outcome (Y). Equation (2) above can be rewritten into a simpler dichotomous logistic regression equation as shown in equations (3) to (6) below:

$$\ln(odds) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n + \varepsilon \quad (3)$$

Where

$$odds = \frac{Prob(event)}{Prob(no\ event)} = \frac{P}{1-P}$$

$$\ln\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n + \varepsilon \quad (4)$$

$$p(event) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n + \varepsilon)}} \quad (5)$$

Or

$$p(Y) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n + \varepsilon)}} \quad (6)$$

Where P(Y) is the probability of a given outcome to be predicted

B_0 is a constant term.

X_i is the independent variables for i=1, 2, .., n.

B_1, β_2, ..., β_n are the parameters of the model and act as constants for each attribute.

3.4 Logistic Regression Model for Tax Risk Analysis

Tax compliance can be measured in the four areas of registration, filing, reporting and payment compliance. Compliance among individual taxpayers can be assessed based on each of these four categories. The overall tax compliance can then be modelled as a summation of the four categories of compliance.

The logistic regression equation (6) above is used to analyze determinants of tax compliance. The dependent variable in the model is the probability of a taxpayer being noncompliant. The same equation is used to find the determinants of noncompliance with regard to payment, filing and reporting which are assessed separately.

Table 1 below shows the four areas of compliance that the study seeks to analyze.

Table 1: Compliance variables

Variable	Symbol	Description	Non-compliance Score	Compliance Score
Registration compliance	RegCom	Taxpayer registered with the tax authority is compliant; not registered is non-compliant	1	0
Filing compliance	FilCom	Actual filing date (AFD) occurring before the statutory filing date (SFD) is filing compliant; occurring after SFD is non-compliant.	1	0
Reporting compliance	RepCom	Reported income (RI) equals to audited income (AI) means reporting compliant and RI less than AI is non-compliant.	1	0
Payment compliance	PayCom	Actual tax payment (ATP) higher or equal to statutory tax payments (STP) refers to payment compliant and ATP lesser than STP is payment non-compliant.	1	0

Tax compliance	Comp	Compliant in all the four components; meaning AFD occurring before SFD, RI equals AI and ATP higher or equal to STP.	1	0

The analysis starts with an over-parameterized model whose covariates are selected based on the five broad categories of behavioral factors, control process for complex transactions, involvement in transactions of concern to the revenue authority, quantitative factors regarding compliance history of taxpayers, and sector specific risk factors. This provides twenty six (26) possible explanatory variables and non-significant ones are eliminate until we remain with only plausible covariates.

The study first seeks to test empirically how taxpayers' non-compliance behaviors are associated with their personal attributes. This entails an analysis of a sample of taxpayers that have already undergone a compliance risk profiling in the past three years. It includes both taxpayers found to be noncompliant and those that are compliant. The logistic regression analysis involves testing the relationship between noncompliance and a range of quantitative and qualitative variables attributed to taxpayers. Given plausible results from the model, the analysis is extend to another sample of taxpayers with similar characteristics to assess the extent of compliance risk as well as prediction of non-compliance among taxpayers that have not undergone compliance risk profiling.

3.5 Sample Design and Data Collection

The purposeful sample of taxpayers is selected and comprises taxpayers drawn from the following nine economic sectors.

i) Agricultural and livestock production,
ii) Mining and quarrying,
iii) Manufacturing,
iv) Electricity, gas and water,
v) Construction,
vi) Sale, maintenance and repair of motor vehicles and motorcycles, wholesale and retail trade, restaurants and hotels,
vii) Transport and communication,

viii) Financing, insurance, real estate and business services,

ix) Community, social and personal service.

All the ninety eight (98) taxpayers used in the study are drawn from the Large Taxpayers Office (LTO). The sample is purposeful because we wanted to use taxpayers that have already been profiled so that the results are comparable.

3.6 Data and sources

The data used in this study are drawn from the Large Taxpayers Office (LTO). The data set comprises ninety eight (98) taxpayers that had been profiled over the period 2009/10 to 2011/12. It includes both taxpayers found to be noncompliant as well as those that were found to be compliant. The essence of having both noncompliant and compliant taxpayers is to assess the predictive power of the model is how well it accurately predicts noncompliant taxpayers.

3.0 Result Analysis

4.1 Overview of variables used

The model to assess compliance risk formulated in the methodology chapter assesses the determinants of full compliance using independent variables that are either sector specific or specific to particular taxpayers. The independent variables used also represent the five areas of concern to taxpayer compliance risk. The areas are cultural and behavioral factors, control process for complex transactions, financial indicators, history of taxpayer compliance and erratic factors.

The variables used to capture cultural and behavioral factors are the type of business ownership, whether the sector has an oversight body and whether the taxpayer engages a tax agent/auditor in preparing tax returns.

The variable used to capture the control of complex transactions is the nature of the taxpayer's business. This is whether the business falls in a sector with complex and technical operations.

The variables used to capture the financial performance of the taxpayer are whether the taxpayer meets performance targets, whether the taxpayer has recorded declining profitability, declining

liquidity ratio, whether profit margin deviates from the industrial standard and the increase in turnover against fixed assets.

The history of taxpayer compliance is captured by the variables on whether the taxpayer has been making timely submission of tax returns, the proportion of returns submitted late, whether the taxpayer had been issued with additional tax assessment, the history of the tax agents/auditors the taxpayer uses, the frequency of change of the tax agents/auditors and difference in tax declared versus tax paid.

The variables used to capture erratic factors that could affect taxpayer compliance are whether the taxpayer falls in a sector with erratic actual tax payments in the past.

The dependent variable used in the study is full compliance. The variable captures whether the taxpayer is compliant in all the four areas of compliance namely registration, reporting, filing and payment.

4.2 Sample size

The data used in this exploratory study was collected from the Large Taxpayers Office. The study is exploratory in nature due to a small sample of data that was available for use. A total of 98 taxpayers were sampled from various economic sectors. Responses were recorded with regard to the above variables of compliance. Both the dependent and independent variables were coded to get data in a binary form in order to make it suitable for a logistic regression analysis. The independent variables were 64 with 98 observations. According to Hosmer and Lemeshow, the sample size should be at least ten times the number of independent variables in order to guarantee plausible results. In this case, since the sample size is limited, we reduced the number of independent variables in order to ensure that the regressions are plausible. The independent variables were reduced to 18 which were good enough to guarantee plausible results as shown by the diagnostic tests reported in the next sections.

The analysis was carried out using the Statistical Package for the Social Sciences (SPSS) software. The variables used in the logistic regressions were selected based on the significance of the score statistic and removal testing based on the probability of the Wald statistic. The selection of

variables was done through the forward selection (Wald) in which stepwise selection method was used. Those that were highly insignificant were removed. In the end we remained with ten independent variables which were used in the regressions and whose results we report in the following sections.

4.3 Descriptive statistics

Table 2: Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	98	96.1
	Missing Cases	4	3.9
	Total	102	100.0
Unselected Cases		0	.0
Total		102	100.0

a. If weight is in effect, see classification table for the total number of cases.

Table 2 above shows summary statistics of the data used. There were 98 observations used in the analysis. The dependent variable is payment noncompliance. The variable captures the taxpayers who have not complied with the payment compliance requirement against those that have met the payment compliance. The variable is dichotomous with payment noncompliance being represented as 1 and 0 for otherwise.

Table 3: Classification Table[a,b]

Observed			Predicted		
			Paynoncomp		Percentage Correct
			No	Yes	
Step 0	Paynoncomp	No	54	0	100.0
		Yes	44	0	.0

Overall Percentage			55.1

a. Constant is included in the model.

b. The cut value is .500

Table 3 above shows model prediction of compliance. The results show that 100% of payment compliant taxpayers are correctly predicted. The overall prediction capability of the model is 55.1%.

Table 4a: Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	40.325	18	.002
	Block	40.325	18	.002
	Model	40.325	18	.002

Table 4b: Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	94.509[a]	.337	.451

a. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.

Table 4c: Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	11.243	7	.128

Table 4d: Classification Table[a]

Observed			Predicted		
			Paynoncomp		Percentage Correct
			No	Yes	
Step 1	Paynoncomp	No	43	11	79.6
		Yes	12	32	72.7
	Overall Percentage				76.5

a. The cut value is .500

Tables 4a to 4d above provide results on the overall specification of the regression model. The omnibus tests of the model coefficients as shown in table 4a reports that the step, block and model coefficients are all significant at 1% with the -2 Log likelihood chi-square reducing from 94.5 to 40.3. The Cox & Snell and Nagelkerke R-square are reported in table 4b as 0.34 and 0.45 respectively. This means that the model explains about 45% of the changes in the taxpayer compliance and hence can be relied upon for policy direction. The Hosmer and Lemeshow test measures how well the model fits the data, which is the goodness of fit test. The null hypothesis is that the model is fit. The results show that the chi-square value of 11.2 cannot be rejected (p-value is 0.13) thereby implying that the model fits the data well. We therefore conclude that the model is well specified.

The classification table above (table 4d) shows an improvement in the model prediction capability after using only selected variables. The model correctly predicts 80% of payment compliant taxpayers and 73% of non-compliant taxpayers. The overall prediction power is 77%. This further reinforces model reliability.

Another measure that tells us the usefulness of the model is called the proportional by chance accuracy rate which takes into consideration 25% improvement over the rate of accuracy achievable by chance alone. This means that even if the independent variables did not have any relationship to the groups defined by the dependent variable we would still expect to be correct in

our predictions of group membership some percentage of the time. The proportional by chance accuracy rate is computed by summing up the squared percentage of cases in each group and compared to the overall percentage accuracy rate produced by SPSS at the last step in which variables are entered to 2% more than proportional by chance accuracy. This is computed as follows:

$PCA = 1.25(0.449^2 + 0.551^2) = 0.632$

PCA = 63.2% compared to overall percentage accuracy of 76.5%.

Since the overall percentage accuracy of 76.5% is greater than the proportional chance accuracy of 63.2%, then the model is said to be useful and can be relied upon for further analysis. Besides the goodness of fit, tax administrations also use the 'confusion matrix' to determine the viability of a model. This technique is applied to the results in the classification table 4d above to generate the selection criteria under the confusion matrix which is shown in table 4e below. The outcome of an event can be categorized into one of the two categories either true (1) or false (0) thereby providing four possible outcomes as follows:

i) True Positive (TP): Predicted and actual results are 1 (valid detection)
ii) False Positive (FP): Predicted result is 1, but actual result is 0 (False alarm)
iii) False Negative (FN): Predicted result is 0, but actual result is 1 (missed detection)
iv) True Negative (TN): Predicted and actual results are 0 (valid non-detection).

Table 4e: Confusion Matrix

Actual	Predicted	
	Payment Noncompliant	Payment compliant
Payment Noncompliant	True Negative (TN) 43	False Negative (FN) 11
Payment Compliant	False Positive (FP) 12	True Positive (TP) 32

The following selection criteria are computed:

i) Accuracy rate: (TN+TP)/Total. This measures the proportion of cases that are correctly predicted by the model. The rate is (43+32)/98= 76.5%

ii) Prediction efficiency: TP/(TP+FN). This measures the proportion of noncompliant cases which are correctly predicted by the model. The rate is 32/(32+11)= 74.4%

iii) Strike rate: TP/(TP+FP). This measures the proportion of noncompliant cases likely to be detected if predicted noncompliant cases are audited. The rate is 32/(32+12)= 72.7%.

According to Vellutini (2011) there is a trade of between the prediction efficiency and strike rate. This means that in order to increase the prediction efficiency, the strike rate has to be reduced and vice versa.

4.4 Logistic Regression Results

Table 5 below shows the regression results of the payment noncompliance model. The results show that business ownership, status of the tax agents, type of transactions involved and financial performance with regard to profitability are significant determinants of payment noncompliance at 5% level of significant. The taxpayer meeting set performance targets, erratic performance measured by high tax deviations in the past three years, declining liquidity ratio, company structure and frequency of investment deductions are significant determinants of payment noncompliance at 10% significance level.

The variable Ownership captures the ownership characteristics of the taxpayer. This is a categorical variable where sole proprietorships, partnerships and private companies are group together and represented by 1 against SACCOs, trusts, associations, public non-listed companies and public listed companies which are presented by 0. The results show that sole proprietorships, partnerships and private companies are 85% less likely to be noncompliant compared to SACCOs, trusts, associations and public companies.

Agentunclean variable captures the characteristics of the agents/auditors that prepare tax returns for taxpayers. In this category there are taxpayers that prepare their own tax returns, taxpayers whose tax returns are prepared by tax agents not registered with a recognized professional regulator, tax agents who have had at least 20% of their clients issued with additional assessments of more than 20% of self-declared tax in the past three years and taxpayers represented by tax agents that have been found guilty of professional misconduct by recognized professional regulator in the last three years. This category is represented by 1 while 0 represent taxpayers not falling in

any of the above groups. These are taxpayers whose returns are prepared by tax agents that are registered with a recognized professional regulator and have not had their clients issued with additional assessments or found guilty of professional misconduct in the last three years. The results show that taxpayers who prepare their own tax returns, those whose tax returns are prepared by tax agents not registered with a recognized professional regulator and those who have had been given additional assessments as well as those whose returns are prepared by tax agents found guilty of professional misconduct are 490% more likely to be noncompliant compared to taxpayers whose returns are prepared by registered tax agents and who have not had additional assessments or professional misconduct.

The variable targetnotmet captures taxpayers who have missed their sector targets for the past three years by over 50%. These are represented by 1 while those taxpayers who have met more than 50% of their sector targets for the past three years are represented by 0. The results show that those with less than 50% achievement of sector targets do not have significant chances of being noncompliant with regard to tax payment compared to their counterparts who meet more than 50% of their sector targets. This is show by the 99.7% less likely chance of being noncompliant.

Hightaxdevion captures the erratic performance of the sector in which the taxpayer belongs. Taxpayers in a sector with erratic actual tax payments deviating by over 70% in the past three years are categorized as 1 while those with erratic tax payments deviating by less than 70% over the past three years are categorized as 0. The results show that taxpayers who belong to a sector with highly erratic performance were 91% less likely to be noncompliant with regard to payment as compared to those that operate in sectors that have less erratic performance.

The variable complex captures the nature of the business of the taxpayer. Taxpayers with highly complex and highly technical operations are represented by 1 while those whose businesses are not complex or do not have highly technical operations are represented by 0. The results show that taxpayers whose businesses are highly complex and those whose operations are highly technical are 422% more likely to be noncompliant compared to those taxpayers whose sector is not complex and do not have highly technical operations.

The variable Declineprofit captures financial performance of taxpayers. Taxpayers who have had their profitability reduce by over 50% in the past three years are categorized as 1 and those whose

profits have declined by less than 50% in the past three years represented by 0. The results show that taxpayers whose profitability declined by over 50% in the past three years are 3,124% more likely to be noncompliant with regard to payment compared to those whose profitability has not reduced by over 50%.

Declineliquid captures the proportion by which the taxpayer's liquidity ratio has declined over the past three years. Taxpayers who liquidity ratio has declined by over 70% in the past three years are represented by 1 while those whose liquidity ratio declined by less than 70% are represented by 0. The results show that taxpayers whose liquidity ratio declined by over 70% in the past three years are 2,090% likely to be noncompliant compared to the other category of taxpayers whose liquidity ratio did not decline by over 70%.

Groupcononres variable captures the company structure of taxpayers. Companies that belong to a group of companies with branches in other countries are represented by 1 while those that are purely domestic as well as those without foreign affiliations are represented by 0. The results show that companies with branches in other countries are 83% less likely to be noncompliant with regard to payment compared to companies that are fully domestic and do not belong to a group of companies.

Investment deduction frequency variable captures the frequency with which a taxpayer makes investment deduction claims. Taxpayers that have made investment deduction claims more than twice in the past three year are represented by 1 while those that have made less than two claims are represented by 0. The results show that taxpayers who made investment deduction claims more than twice in the past three years are 335% more likely to be noncompliant with regard to payment compared to those that made less claims.

In summary, the results in table 5 below indicate that cultural and behavioral characteristics of the taxpayer, control of complex transactions, financial performance of the taxpayer, history of taxpayer compliance and erratic factors of the sector are the broad determinants of taxpayer noncompliance with regard to payment.

Table 5: Variables in the Equation

	Variable	B	S.E.	Wald	df	Sig.	Exp(B)	%
1.	Ownership	-1.882	.748	6.338	1	.012**	.152	-84.8
2.	Unregulated	1.211	1.161	1.089	1	.297	3.357	235.7
3.	AgentUnclean	1.775	.838	4.484	1	.034**	5.901	490.1
4.	Targetnotmet	-5.746	3.022	3.616	1	.057*	.003	-99.7
5.	Hightaxdevion	-2.378	1.437	2.740	1	.098*	.093	-90.7
6.	Complex	1.652	.810	4.152	1	.042**	5.215	421.5
7.	Latesub	-2.887	1.999	2.086	1	.149	.056	-94.4
8.	Nosubmission	4.182	2.885	2.101	1	.147	65.495	6,449.5
9.	Diftaxdecl	1.280	1.225	1.092	1	.296	3.597	259.7
10.	Addassess	-1.008	1.048	.927	1	.336	.365	-63.5
11.	Incrtax	-1.017	.949	1.147	1	.284	.362	-63.8
12.	Declineprofit	3.473	1.411	6.055	1	.014**	32.238	3,123.8
13.	Declineliquid	3.087	1.851	2.781	1	.095*	21.902	2,090.2
14.	Profitdeviation	2.834	2.402	1.391	1	.238	17.007	1,600.7
15.	Increaseturnover	-4.747	3.557	1.781	1	.182	.009	-99.1
16.	Groupcononresid	-1.771	.972	3.323	1	.068*	.170	-83.0
17.	Investmentdeductionfrequency	1.470	.856	2.946	1	.086*	4.348	334.8
18.	Investmentdeductionmagnitude	-1.086	1.002	1.175	1	.278	.338	-66.2
19.	Constant	-.251	1.142	.048	1	.826	.778	-22.2

** and * Significant at 5% and 10% levels respectively.

4.0 Conclusion and Policy Recommendations

5.1 Conclusion

The objectives of this study were three-fold. The first was to develop a regression model for taxpayer compliance risk management. The second objective was to identify determinants of taxpayer compliance risk while the third objective was to assess the effectiveness of the current risk profiling frameworks used by the revenue departments. In the endeavor to achieve the objectives, the literature reviewed pointed at six categories of factors that determine taxpayer compliance. These are economic, social, psychological, demographic, institutional and political factors. These factors were further categorized into five areas that could be easily captured for regression purposes. These are cultural and behavioral factors, control process for complex transactions, financial performance, history of taxpayer compliance and erratic factors.

The literature review, both theoretical and empirical, pointed out to the use of a logistic regression model for identifying the determinants of taxpayer compliance risks. A binary logistic regression model was therefore specified where the dependent variable was a measure of payment compliance. The binary variable of payment compliance was whether or not a taxpayer complied with payment compliance requirements in the period 2009/10 to 2011/12. The independent variables were also categorical in nature with data obtained from the Large Taxpayers Office database.

The results showed that the model was well specified and had an overall percentage of prediction of 77%. This was further supported by the goodness of fit as measured by the Hosmer and Lemeshow statistic and the pseudo R-squared by Nagelkerke. The variable selection procedure was stepwise forward selection (Wald). The result show that nine variables were significant namely: business ownership, characteristics of tax agents, performance targets, erratic performance of the sector, nature of business, financial performance of the taxpayer in terms of profitability and liquidity, company structure and frequency of investment deduction claims. This implies that cultural and behavioral factors, control of complex transaction, financial performance, history of taxpayer compliance and erratic factors are significant determinants of payment compliance.

5.2 Recommendations

It is recommended that the model could be considered for taxpayer profiling. This could be done by profiling taxpayers based on the characteristics found to be significant determinants of taxpayer compliance. Whereas the study does not recommend a replacement of the current risk profiling frameworks used by revenue departments, it is recommended that more weight should be place on the areas that were found to be significant in determining taxpayer compliance. It is further recommended that KRA needs to maintain a more extensive and systematic taxpayer database that permits a more effective risk assessment. This data base would go a long way in ensuring a more effective and transparent tax administration.

5.3 Limitations of the study

The main limitation of the study is with regard to data availability. Despite the fact that there were more than thirty possible determinants of taxpayer compliance risk, they could not all be used in the regression due to the limited sample size. According to Hosmer and Lemeshow, the sample size should be at least ten times the number of independent variables to ensure plausible results. The study is therefore exploratory and forms a basis for further studies in the same field when a robust data set would have been established at the Kenya Revenue Authority.

The other limitation is that the study only addressed the payment compliance status of taxpayers. This is because there were no disaggregated data to carry out separate analyses of the four areas of compliance. Again the data was not enough to undertake such a comprehensive analysis.

5.4 Areas for further research

It is recommended that revenue departments build up a more robust database of compliance risk profiling to enable future research work in this area. Annual data on taxpayers who undergo compliance actions should be collected and stored. Collection of adequate data would enable future studies undertake a disaggregated compliance risk analysis based on the four areas of compliance and for each tax head.

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