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The Mwanza Formula: A Comparative static analysis of Tax revenue, compliance and evasion.

Prepared by Kampamba Shula<sup>1</sup>

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Abstract

This paper proposes how tax rate cuts can increase revenues by improving tax compliance whilst reducing tax evasion especially in a substantially informal economy like Zambia. In this paper, a theoretical model of tax evasion, inspired by Gary S Becker's Crime and Punishment: An Economic approach, is briefly presented. A renewed mathematical approach called the "John Mwanza " Formula is introduced extending into comparative static analysis discussing tax evasion, compliance, complexity and even tax audit probability all in the vein of formulating a model that can at the margin gives us a clearer structure of the rather daunting task of increasing tax revenue whilst lowering tax rates.

Keywords: tax evasion, tax compliance, tax rate, tax simplification, probability

Author's E-Mail Address: [research-2@zacci.co.zm](mailto:research-2@zacci.co.zm)

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<sup>1</sup> The Author is Research Officer at Zambia Chamber of Commerce and Industry and also serves as Secretary of the Zambia Private Sector Alliance.

## Back ground & Rationale

The Private Sector in Zambia and the Government have for a long time been at loggerheads with regards to tax rates and revenue. Government wants more revenue which usually tends to support suggestions for increasing tax rates. This tendency can best be explained by the “Law of the instrument” a phrase from Abraham Maslow's *The Psychology of Science*, published in 1966 which says “if all you have is a hammer, everything looks like a nail”. The Private sector on the other hand have been searching and looking for ways to convince Government to reduce tax rates and stimulate growth which will lead to higher revenue. The Private sector has recently stressed the effects of tax evasion on Tax revenue loss. This apparent catch 22 motivated a more critical look at the factors affecting tax revenue in Zambia.

A paper by (Takáts, 2008)<sup>2</sup> shows how tax rate cuts can increase revenues by improving tax compliance. The intuition is that tax evasion has externalities: tax evaders protect each other, because they tie down limited enforcement capacity. Thus, relatively small tax rate cuts, which decrease incentives to evade taxes, can lead to increased revenues through spill overs creating Laffer effects. Tax rate cuts can affect tax revenues through two main channels: Affecting the tax base or affecting compliance with the tax rules.

The core of this paper introduces to the Zambian audience a deeper look at Tax evasion dynamics and how a better understanding of evasion can inform policy.

No government can announce a tax system and then rely on taxpayers’ sense of duty to remit what is owed. Some dutiful people will undoubtedly pay what they owe, but many others will not. Over time the ranks of the

dutiful will shrink, as they see how they are being taken advantage of by the others. Thus, paying taxes must be made a legal responsibility of citizens, with penalties attendant on noncompliance. But even in the face of those penalties, substantial tax evasion exists—and always has. The history of taxation is replete with episodes of evasion, often notable for their inventiveness. During the third century, many wealthy Romans buried their jewellery or stocks of gold coin to evade the luxury tax, and homeowners in eighteenth-century England temporarily bricked up their fireplaces to escape notice of the hearth tax collector (Webber, 1986).

The mere presence of tax evasion does not imply a failure of policy. Just as it is not optimal to station a police officer at each street corner to eliminate robbery and jaywalking completely, it is not optimal to eliminate tax evasion (for a formal demonstration of this point, see Baldry, 1984). The recognition of tax evasion introduces a new set of policy instruments whose optimal setting is at issue; for instance, what should be the extent of audit coverage, the strategy for choosing audit targets, and the penalty imposed on detected evasion? The reality of tax evasion also invites a rethinking of standard taxation problems.

The mathematical relationships we visualise when discussing real world problems affect the conclusions that we inevitably make. Tax revenue in Zambia is one example. It has long been a matter of general knowledge in Zambia that tax revenue is a function of compliance or put differently, the amount of money Government collects is related to the number of people who are actually tax compliant. Even in circles of Government and private sector interactions this has always driven discussions to expand the tax base so that more revenue is collected. Local media is filled with experts commenting on how the tax base must be

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<sup>2</sup> Takáts, T. K. P. a. E., 2008. Tax Rate Cuts and Tax Compliance—The Laffer Curve Revisited, s.l.: IMF Working Paper

expanded in the country with little or no suggestions on exactly how that is supposed to be done with a substantial part of the economy being informal. If we consider the tax rate as a constant then we can represent current thought around tax revenue with the formula below.

$$Z=f(C) = rC$$

**Where  $Z$  is tax revenue,  $r$  is the tax rate and  $C$  is Compliance.**

## Methodology

In reality, most independent variables are dependent on more than one dependent variable. As for tax revenue this paper puts forth a rather eccentric proposition that Tax revenue is a function of not only compliance, but evasion and time. This paper proposes discussing tax revenue with the formula below.

$$Z=f(C, E) = r(C/E)$$

**Where  $Z$  is tax revenue,  $r$  is the tax rate,  $C$  is Compliance,  $E$  is evasion.**

This is a new formula called the “Mwanza” formula<sup>3</sup> was created to include tax evasion as a key component in the discussion for tax revenue. The reason for placing Evasion in the denominator of the equation stems from the following reasoning. Intuitively, the gains from tax evasion drop faster than potential costs as the tax rate decreases.

## Tax Evasion

This will sound counterintuitive but whoever said Crime doesn't pay, lied. Morality aside, Crime is a rational function of expected gain less expected loss. The expected loss is a function of the probability of getting caught multiplied by expected punishment. Rational Crime pays. Under reporting your tax liability is a rational crime.

According to (Becker, 1974) entry into illegal activities can be explained by the same model of choice that economists use to explain entry into legal activities, that offenders are (at the margin) "risk preferrers." Consequently, illegal activities "would not pay" (at the margin) in the sense that the real income received would be less than what could be received in less risky legal activities. The conclusion that "crime would not pay" is an optimality condition and not an implication about the efficiency of the police or courts; indeed, it holds for any level of efficiency. Using logic from Gary S Becker's model we are able to look at tax evasion as a rational choice and as such make better recommendations on how to deal with it.

As (Becker, 1974) explains, the optimal amount of enforcement (tax authority) is shown to depend on, among other things, the cost of catching and convicting offenders, the nature of punishments—for example, whether they are fines or prison terms—and the responses of offenders to changes in enforcement. The discussion, therefore, inevitably enters into issues in penology and theories of criminal behaviour. It is suggested, for example, that a useful theory of criminal behaviour can dispense with special theories of anomie, psychological inadequacies, or inheritance of special traits and simply extend the economist's usual analysis of choice.

The basic theoretical framework for tax evasion was derived by (Allingham & Sandmo, 1972) from the Becker model of crime (Becker, 1974). This approach views tax evasion as a gamble since some degree of risk is always present in the context of evasion (Kopczuk, 2006).

The tax declaration decision is a decision under uncertainty. The reason for this is that failure to report one's full income to the tax authorities does not automatically provoke a reaction in the form of a penalty (Allingham &

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<sup>3</sup> This “Mwanza” formula was drafted by the Author Kampamba Shula in honor of his high school

mathematics teacher, John Mwanza. The final version of the formula is shown at the end of this paper.

Sandmo, 1972). The taxpayer has the choice between two main strategies: (1) He may declare his actual income. (2) He may declare less than his actual income. If he chooses the latter strategy his payoff will depend on whether or not he is investigated by the tax authorities. If he is not, he is clearly better off than under strategy (1). If he is, he is worse off. The choice of a strategy is therefore a non-trivial one.

Before we can discuss evasion at the macro level we must understand it at the micro level to gain insight into the rationale of an individual in evading tax.

We shall assume as did (Allingham & Sandmo, 1972) that the tax-payer's behaviour conforms to the Von Neumann-Morgenstern axioms for behaviour under uncertainty. His cardinal utility function has income as its only argument; this must be understood as the indirect utility function with constant prices. Marginal utility will be assumed to be everywhere positive and strictly decreasing, so that the individual is risk averse.

In the economic models, the decision whether to evade at all turns out to depend only on this comparison: if the expected gain is greater than the expected loss, the taxpayer decides to evade at least a little. How much is evaded depends on the aversion to risk, the expected gain, and the risk faced by the taxpayer (Kopczuk, 2006).

As concluded by (Allingham & Sandmo, 1972) the policy tools available to the government for the purpose of counteracting the tendency to evasion are the tax rates themselves, the penalty rates and the expenditure on investigation, which determines the probability of being detected. To assess the efficiency of these tools one would need empirical estimates of the effects discussed in this paper.

## Complexity and Tax Avoidance

Thus far in this paper we have left out discussing Tax avoidance and complexity of the tax system but their exclusion so far has only be to aid a logical flow of reasoning rather than an apparent oversight.

The central objective of reform should be simplifying the tax system. Reasonable simplification can more adequately combat tax evasion and avoidance than traditional enforcement measures and, at the same time, simplification would make standard enforcement policies more effective without increased enforcement spending (Kopczuk, 2006). The ideal compliance policy should target both tax avoidance and tax evasion. While there is a legal distinction between the two, from the economic point of view the difference is less explicit. Both types of activity involve a loss of revenue and both involve a loss of economic welfare. The loss of revenue implies an additional economic cost because the revenue must be recouped by resorting to further distortionary taxation. In the case of the simplest form of tax evasion, an additional loss of welfare is due to the risk taken by the (cheating) taxpayer. In the case of more complicated forms of purely tax-motivated financial planning, taxpayers use up real resources to shelter income. Preventing such waste should be a leading concern in tax policy. In particular, from an efficiency point of view, it does not matter whether or not the underlying activity is legal.

As (Kopczuk, 2006) explains that while the implications of tax complexity are multi-dimensional, its most important consequence is the extent of opportunities for tax avoidance and evasion that it creates. By reducing tax complexity, policy makers change how responsive taxpayers can be to changes in taxation. Consequently, a less complex tax system may provide a lower marginal excess burden of taxation. When the tax system is less costly, enforcement is less important because alternative ways of collecting revenue are less

damaging. Tax evasion is illegal while tax avoidance may be legal, but from the economic point of view, they are similarly costly and tax avoidance should be a higher priority target. Tax complexity increases the likelihood that taxpayers are non-compliant unintentionally. This has an important policy consequence: when taxpayers make honest mistakes, enforcing taxes is harder because it requires distinguishing between cheaters and honest-but-confused taxpayers. Therefore, complexity reduces the effectiveness of standard enforcement tools such as detection or penalties. There may be positive aspects of tax avoidance. One should consider opportunities for tax avoidance as a potential policy tool. While in most cases avoidance is undesirable, there may be circumstances when limited and judiciously designed avoidance opportunities are socially beneficial.

## The problem of tax audit probability

This paper proposes the idea of including the probability of a tax audit as a variable in the multi variable calculus equation of tax revenue. The logic of this stems from applying the rationality of tax evasion as based on the (Becker, 1974) model. In deciding whether to evade tax a company or individual will calculate the probability (or at the very least estimate it) of getting caught which relates to the probability of a tax audit.

The problem of tax audit probability is important in the Zambian context because much of the economy is informal and of the companies that do pay tax, the decision as to whether they get audited depends on abilities of the revenue authority to set priorities. The higher value of the function of tax audit probability corresponds to a higher degree of taxpayer's honesty. When everybody cheats, a comparison of honest and dishonest taxpayers becomes impossible (Anciūtė & Kropienė, 2010). The simplest calculation of the tax audit

probability ( $p$ ) can be defined by using the classic definition of probability:

$$p = \text{Number of possible tax audits (taxpayers to be audited)} / \text{Total number of taxpayers}$$

The tax audit probability actually depends on whether the tax authorities can (and how well) distinguish the tax evaders from the whole population and whether the institution has resources enough to perform the control of all risky taxpayers. Therefore, there are several important parameters: the accuracy of the identification (forecast) of tax evasion, the number of potential tax evaders, and the auditing capacity of tax authorities. The number of potential cheaters and the capacity to deal with them are constantly important because there are always more dishonest taxpayers than the tax auditors. Considering the mentioned facts, it is useful to adjust the function of tax audit probability:

$$p = p(m, n, k)$$

Where  $m$  is the variable representing the tax authority's ability to identify potential tax evaders,  $n$  stands for the number of potential tax evaders, and  $k$  is the possible number of audits. When the values of  $m$  and  $k$  increase, the tax audit probability increases, and when the number of potential cheaters increases, the value of the probability function decreases. The parameter  $m$  could also express the abilities of a tax administrator to set the priorities (Anciūtė & Kropienė, 2010). For example, there can be two persons potential tax evaders identified, but one of them is a natural person who has a small garden and sells apples in a market without declaring her income, and the other taxpayer is a company which provides catering services, also concealing some of its revenue. Naturally, it is wiser to audit the company.

This approach highlights a number of factors that determine whether and to what extent taxes are evaded. These are: the magnitude of potential savings (which, on the margin, is simply equal to the tax rate), the probability of

getting caught, and penalties when caught. More subtly, the extent (but not the presence) of evasion depends on risk aversion, which itself may be a function of the level of income, and it may depend on the tax liability. This model therefore highlights three natural policy parameters that can affect evasion. Zambia Revenue Authority (ZRA) can work harder at trying to find cheaters, it can punish them more severely, or the marginal gains from tax evasion could be reduced by imposing lower marginal tax rates.

## Conclusion

We began this paper by discussing the rationale and later explained the “Mwanza” formula and followed through with a strong theoretical framework of literature. In light of the theoretical frameworks already established it calls for an obvious amendment to the structure of our formula. The notation below shows the final version of the Mwanza formula which by Comparative static analysis it is possible, at least partially, to evaluate the influence of changes of the model’s parameters on a person’s decision to evade tax and consequently tax evasion at the macro level.

$$Z=f(C, E, S) = r * p * S * (C/E) - A$$

**Where  $Z$  is tax revenue,  $r$  is the tax rate,  $C$  is Compliance,  $p$  is probability of tax audit,  $E$  is evasion (or Tax avoidance),  $S$  is simplicity of the tax system and  $A$  is the cost of revenue collection to the authority.**

When we run partial derivatives on this multi variable equation we are able to give optimal

policy advice on which tools the authorities can use to maximize tax revenue with respect to various parameters listed. The aim of this formula is not solve all the issues with regards to tax revenue<sup>4</sup> explicitly but at the very least it should be robust enough to inform practical policy prescriptions. Using these prescriptions we are able to show that the tax rate can be reduced and tax revenue still be increased through adjusting one of these other variables. For example the partial derivative of evasion relative to revenue is at the margin affected by its coefficient being the marginal tax rate. The best way to conclude such a paper is draw from the great Gary S Becker’s “Crime and Punishment: An Economic Approach”. As (Becker, 1974) concludes, optimal policies to combat illegal behaviour are part of an optimal allocation of resources. Since economics has been developed to handle resource allocation, an "economic" framework becomes applicable to, and helps enrich, the analysis of illegal behaviour. At the Same time, certain unique aspects of the latter enrich economic analysis: some punishments, such as imprisonments, are necessarily nonmonetary and are a cost to society as well as to offenders; the degree of uncertainty is a decision variable that enters both the revenue and cost functions. The policy recommendations that can be drawn from this paper include the variables that policy makers can adjust below:

1. Reduce the tax rates
2. Increase probability of tax audits and improve evasion legislation
3. Simplify the tax code

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<sup>4</sup> This formula doesn’t claim to be able to calculate evasion, but we can proxy using Von Neumann-

Morgenstern axioms for behaviour under uncertainty

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