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Import Base and Revenue Improvement Possibilities in Tanzania

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Abstract *This paper analyzes buoyancy and elasticity estimates of different tax items on import base. Using the Divisia Index approach, the buoyancy estimates have been used to estimate elasticity estimates. The findings reveal positive buoyancy and elasticity estimates. Since the Divisia Index values are positive but less than unit, their logarithm values are negative, making the discretionary portion of the buoyancy estimate to be negative. The negative discretionary portion of the buoyancy estimates resulted into higher values of elasticity compared to buoyancy estimates. The government should broaden the tax base, reduce tax rates and reduce tax exemption in order to improve revenue collection without resorting to higher tax rates. With lower tax rates and higher penalties on tax evasion and tax avoidance, higher government revenue can be realized to meet growing government expenditure.*

Key words Tax base, tax buoyancy, tax elasticity, Divisia index

JEL Codes: H2, H21, H26

1. Introduction

It is argued that most countries tend to increase their expenditure in order to push their economic growth. In this the expectation is that increasing income in the economy is likely to raise their revenue. Unfortunately many of these countries have not managed to lift up their revenue to the level of their public spending and as a matter of facts their growth has not been sustainable (Dudine and Jalles, 2017). Tanzania has been working hard to mobilize its resources to improve tax revenue collection due to the fact that aids from donor countries have been declining annually. As a developing country, Tanzania's revenue performance has not been in line with its peer countries of the same development level. The tax to GDP ratio has been relatively lower compared to the average of East African community and low income countries. For instance, over the period 2011 to 2013, the ratio was 11.9 percent well below 13.1 percent of East African Community, and 14.7 percent of low income countries (Baunsgaard *et al.,* 2016).

However, there have been improvements in revenue collection due to a series of reforms undertaken by the government. The introduction of Value Added Tax (VAT) in 1998 improved tax administration and the government involvement in infrastructural investments improved productivity in the manufacturing and other private enterprise (Baunsgaard *et al.*, 2016). These reforms have not yielded the expected outcome though primarily due to poor implementation (Fjeldstd, 1995). Tanzania has been reforming her tax system since early 1960s. Some of the reforms involved introduction of alternative forms of tax due to reduction of tax revenue from other forms of tax. Sales tax, for instance, was introduced in 1969, partly to offset the revenue gap made by declining import duty revenue as a result of growth in import substitution industries, and partly to reduce rural taxation (Osoro, 1995).

Tanzania has been importing and exporting with other countries and regions. The country's trade position with European Union has continued to be stable with 57 percent of export going to the region and 22 percent of total import coming from the region. With the Asian region, the country exports 13 percent of total export to the region and imports 35 percent of total import from the region. South Africa's dominant position in Tanzania's international trade has made the position of SADC in the country's trade to be firm. There has been increasing trade in non-traditional import products and most of the imports from European Union have shifted to South Africa (TPR n.d.). The government has been realizing a growing importance of import duty in the tax revenue, as well as other tax components. For instance, import duty occupies a small portion of tax revenue compared to other tax components, but has been growing in magnitude with other tax components. Import duty, for instance, grew from Tanzanian shillings 784 billion in 2014/15 to 994 billion in 2016/17 and is projected to reach 1,478 billion by 2019/20 (Nord and Zakharova, 2017).

2. Literature review

Tax revenue makes one of the major sources of government revenue for any country. A country that does not collect tax cannot be responsible for its citizens. The power of a nation and its prestige depends on its available resources and the ability to draw from those resources abundant revenue to support the nation and maintain its credit (Dingley, 1899). As countries attain high levels of development, they focus on broader tax base and reducing exemptions (Besley and Persson, 2013). While developing economies rely less on income and property taxes (Leuthold and N'Guessan, 1986), the threat of capital outflow forces highly developed economies to maintain low rates on mobile properties and collect most of their revenues from immobile properties. High property tax revenue productivity, in these economies, is influenced by highly developed construction sectors (Hogan 1960). Nevertheless, their high tax revenue productivity has been much influenced by low tax rates and broad tax base (Escolano *et al*., 2010). The presence of large informal sector, in developing countries, is pointed out to be the major drawback in tax revenue collection (Ndedzu *et al*., 2013). Some scholars, like Timsina have gone far to suggest inclusion of agriculture sector in the tax system simply because it has a large contribution on national income. It is absurd because developing countries rely mostly on export of primary products, specifically agricultural produce. Subjecting the sector to taxation automatically hampers competition (Fleming, 1999), given the fact that, developed nations like United States of America and European countries subsidize their farmers (Schmitz *et al*., 2006).

Tax reform has been an important undertaking for many developing countries. It has moved from the desire for the nation to the need (Osoro, 1993). This is due to the impact it has on economic growth. For instance, the U.S. 1986 Tax Reform Act, according to Auerbach and Slemrod (1997), focused on fairness, simplicity, and economic growth. On the growth objective, the outcomes of 1986 Tax Reform Act seem to be mixed. The effect on the growth rate of replacing the 1985 US income tax structure with a consumption tax is estimated to be of the order 1 percent per capita per year, while replacing the tax on physical capital with a higher wage tax is estimated to be mildly growth reducing (Pecorino 1994). However, the 1986 U.S. tax reform improved efficiency of a temporal resource allocation sufficiently to offset the negative impact of greater effective tax rates on capital income (Jorgenson and Yun, 1990). The government surplus or deficit remains one of the most important variables to measure the success of government fiscal policy in a given economy. In many occasions, tax system fails to generate sufficient revenue to finance recurrent expenditure leading to deficit probably due to lack of responsiveness of tax revenue to changing national income (Kotut and Menjo, 2012).

Economic growth influences government revenue either negatively or positively (Belinga *et al.,* 2014). When tax base grows, tax revenue from such base may grow automatically without resorting to higher tax rates or grow as a result of discretionary measures or a mixture of the two responses. However, for policy purpose, it is usually useful to distinguish between revenue growth due to discretionary changes and revenue growth due to economic growth. For automatic growth, elasticity which controls for discretionary policy changes is employed, while buoyancy estimates does not take into consideration the discretionary changes (Leuthold and N'Guessan, 1986). Tax buoyancy and elasticity studies have varied from specific tax component, such as property tax revenue productivity in Hogan (1960), to whole tax system in Mansfield (1972). Other studies have checked the effect of tax reform on buoyancy, like Upender (2008), who has analyzed the effect of tax reform on gross tax buoyancy in India. Different approaches have been applied in tax elasticity analysis, the dummy variable approach (Upender, 2008), the Prest formula (Prest, 1962), the proportional adjustment method (PAM) (Mansfield 1972), and the divisia index method (DIM) conceptualized in Star and Hall (1976) and applied in Choudhry (1979).

The dummy variable approach can be easily applied to take care of discretionary measures. However, frequent discretionary changes limit its reliability due to reduction in the degrees of freedom. PAM is the best when reliable information on discretionary changes is available. However, in many countries especially developing countries, information are either not available or they do not match the actual rates due to tax evasion and avoidance. So when information on discretionary measures is missing, DIM provides the best approach as it uses time variable as a proxy for discretionary change. The problem with DIM approach is overestimation when discretionary measures have positive effects on revenue and underestimation when discretionary measures have negative effect on revenue. But it is the second best compared to other approaches. Prest formula is computationally complicated and unstable with varying results when applied by different researchers using the same data set (Gillani, 1986).

3. Methodology of research

3.1. Data

This study utilizes quarterly time series data on tax items and import from 1997 to 2015. Tax items data have been extracted from different statistical publications of Tanzania Revenue Authority (TRA), and for import data the study made use of Economic bulletins from the Central Bank of Tanzania (BOT). The observations are sufficiently large to meet the central tendency theorem. The study utilizes information on five tax items namely, Import Duty, Excise Duty on Import, Excise Duty on Petroleum, VAT on Import and VAT on Petroleum. These are categories of tax items under import tax base. The missing data values, in this study, have been filled using the seasonal index, *i* approach as follows: For the future values, the formula is given by $y_{t+1} = y_t(1+i)$ and for the previous values, it is given by $y_{t-1} = y_t(1-i)$.

3.2. Model

The study uses Divisia index method (DIM) to analyze the effect of discretionary measures on revenue. The idea of using this approach is based on the intuition that the effect of a discretionary measure on revenue yield is analogous to the effect of technical change on total productivity. Discretionary tax measures produce changes in tax yield over and above those caused by the automatic growth in the tax bases, as technical change produces changes in total productivity over and above those that can be accounted for by increases in factor inputs. Tax ratios trends for a country can be obtained by setting the aggregate tax function as a homogeneous function of GDP (*x*) such as equation (1). This assumption makes the Divisia index, in this study, to be specified as the Homogeneous Translog index as advocated in Star and Hall (1976). The aggregate tax function is assumed to be homogeneous, but cannot be linear homogeneous and therefore characterized with non-constant returns to scale.

$$T(t) = ax^{\mu} \tag{1}$$

The Divisia index is derived from continuously differentiable aggregate tax function at each instant of time.

$$T(t) = f(x_i(t), ..., x_k(t); t) \tag{2}$$

Where *T* denotes the aggregate tax yield, x_i denotes the proxy tax base for the categories of taxes, and the time variable t is a proxy for discretionary tax measures. The aggregate tax function is assumed to be homogeneous, just like aggregate production function, though not necessarily linear homogenous. The effect of discretionary tax changes at time *t* are obtained by taking the time derivative of *f*. Thus by differentiating the logarithm of tax function with respect to time we get.

$$\frac{\dot{T}}{T} = \frac{f_t(t)}{f(t)} + \sum_1^k \frac{f_i(t)}{f(t)} \dot{x}_i$$

$$\frac{\dot{T}}{T} = \frac{f_t(t)}{f(t)} + \sum_1^k \frac{f_i(t) x_i(t)}{f(t)} \frac{\dot{x}_i}{x_i} \tag{3}$$

Rearranging the above expression results into equation (3')

$$\frac{f_t(t)}{f(t)} = \frac{\dot{T}}{T} - \sum_1^k \frac{f_i(t) x_i(t)}{f(t)} \frac{\dot{x}_i}{x_i} \tag{3'}$$

Setting $\frac{f_i(t) x_i(t)}{f(t)} = \beta_i(t)$ and $\frac{f_t(t)}{f(t)} = \frac{\dot{D}(t)}{D(t)}$ where $D(t)$ is the Divisia Index of discretionary tax change, equation (3') can be rewritten as

$$\frac{\dot{D}(t)}{D(t)} = \frac{\dot{T}}{T} - \sum_1^k \beta_i(t) \frac{\dot{x}_i(t)}{x_i(t)} \tag{4}$$

Equation (4) can be integrated to get the index of discretionary tax revenue over the time interval [0, n]

$$\frac{D(n)}{D(0)} = \left[\frac{T(n)}{T(0)}\right] \exp\left(-\sum_1^k \int_0^n \beta_i(t) \frac{\dot{x}_i(t)}{x_i(t)} dt\right) \tag{5}$$

Normalizing by setting D(0) = 1, D(n) can be viewed as the index of revenue growth owing solely to discretionary tax measures at time *n*. Computing the discretionary index of revenue growth in (5) is empirically difficult. So the fluctuating $\beta_i(t)$ can be replaced by a constant $\tilde{\beta}_i$ which is some form of weighted average of the $\beta_i(t)$. This yields the following equation

$$\int_0^n \tilde{\beta}_i \frac{\dot{x}_i(t)}{x_i(t)} dt = \int_0^n \beta_i(t) \frac{\dot{x}_i(t)}{x_i(t)} dt \tag{6}$$

Integrating the left hand side of equation (6), results into the following expression

$$\tilde{\beta}_i \log\left(\frac{x_i(n)}{x_i(0)}\right) = \int_0^n \beta_i(t) \frac{\dot{x}_i(t)}{x_i(t)} dt \tag{7}$$

Making $\tilde{\beta}_i$ the subject results into the following expression

$$\tilde{\beta}_i = \frac{1}{n} \int_0^n \beta_i(t) \frac{\rho_i(t)}{\bar{\rho}} \tag{7'}$$

Where, $\rho_i(t) = \frac{\dot{x}_i(t)}{x_i(t)}$, and $n\bar{\rho} = \int_0^n \frac{\dot{x}_i(t)}{x_i(t)} dt = \log\left[\frac{x(n)}{x(0)}\right]$. Thus the constant $\tilde{\beta}_i s$ are the weighted average of the fluctuating $\beta_i(t)$, where the weights are the ratios of instantaneous rates of growth of the bases to their average rates of growth in the time interval [0, *n*]. Historical data are often given on annual basis and therefore equation (7) can be written in discrete version as

$$\tilde{\beta}_i = \frac{1}{n} \sum_{t=1}^n \beta_i(t) \frac{\rho_i(t)}{\bar{\rho}} \tag{7''}$$

Where $\beta_i(t) = \frac{T_i(t) - T_i(t-1)}{x_i(t) - x_i(t-1)} \cdot \frac{x_i(t)}{T(t)}$

The left hand side of equation (7) can be taken into the right hand side of (5) to give us equation (8) below.

$$D(n) = \left[\frac{T(n)}{T(0)}\right] \Big/ \prod_1^k \left(\frac{x_i(n)}{x_i(0)}\right)^{\tilde{\beta}_i} \tag{8}$$

Equation (8) expresses the discretionary tax measure as the ratio of the index of total growth of tax revenues to the index of automatic growth of tax revenues. In logarithmic form, equation (8) turns out to be as follows:

$$\log D(n) = \log\left[\frac{T(n)}{T(0)}\right] - \sum_1^k \tilde{\beta}_i \log\left(\frac{x_i(n)}{x_i(0)}\right) \tag{8'}$$

Equation (8') is an alternative version of equation (8) which expresses the growth rate of discretionary tax revenues as the difference between the growth rates of total tax revenues and the automatic tax revenues. The automatic tax revenues growth rate is the weighted sum of the growth rates of the (proxy) bases where the weight $\tilde{\beta}_i$ is obtained from (7).

When the degree of homogeneity of the tax function is assumed to be *r > 0* and, it can be shown that if the growth rates of all the bases are equal to that of GDP, then the tax function will have the form

$$T(t) = ax(t)^r D^*(t) = ax(t)^\mu \tag{9}$$

Where *x* denotes GDP, *D** denotes the index of revenue growth owing to discretionary changes in the time interval [0, *t*], and μ denotes the buoyancy of tax yield. The index *D** is a special case of the index *D*, and for the time interval [0, *n*], it has the same form

$$D^*(n) = \frac{T(n)}{T(0)} \Big/ \left[\frac{x(n)}{x(0)}\right]^{\tilde{\beta}^*} \tag{10}$$

Where $\beta^* = \frac{1}{n}\int_0^n \beta(t)\frac{\rho(t)}{\bar{\rho}}dt$, ρ being the growth rate of GDP

Also from equation (9), it follows that the index *D** can be written as

$$D^*(t) = x(t)^{\mu - r} \quad (11)$$

And for the time integral [0, *n*], *D** can be written as

$$D^*(t) = \left[\frac{x(n)}{x(0)}\right]^{\mu - r} \quad (12)$$

It is now possible to estimate elasticity, *r* from unadjusted historical data. This can be done in steps; first the buoyancy, μ is estimated from unadjusted historical data for the time interval [0, *n*], by estimating the tax function $T(t) = ax(t)^{\mu}$. Second, since the index *D** is derived from the tax function *f* as index *D*, the latter can be substituted in equation (12) and give the following expression.

$$D(n) = \left[\frac{x(n)}{x(0)}\right]^{\mu - \hat{r}} \quad (13)$$

Equation (13) can be expressed in logarithmic form and yield the following equation:

$$\hat{r} = \mu - \frac{\log D(n)}{\log\left[x(n)/x(0)\right]} \quad (14)$$

The elasticity estimates are clearly provided by Equation (14).

4. Findings and discussions

Before running regression analysis and other estimations, the study finds important to explore the behavior of variables. In particular, since the concern is on responsiveness, it is imperative to determine the average growth rates of the variables for the period under consideration. Using the differenced series of their logarithmic form, the mean values of the series account for their average growth rates. On average, the growth rates have been, about 4.4 percent for import base, 3.1 percent for import duty, 4.6 percent for excise duty on import, 5.3 percent for excise duty on petroleum, 4.2 percent for VAT on import, and 3.0 percent for VAT on petroleum. Both the base and the tax items, on average, have been growing positively implying a positive correlation between the base and each tax item.

Time series normally suffer from serial correlation problem in which past residuals affect current residuals. If not accounted for, serial correlation makes standard errors incorrect and understated, OLS becomes inefficient among linear estimators, and OLS estimates are biased and inconsistent if lagged dependent variables are in the right hand side of the equation specification. The lower values of Durbin Watson (DW) statistics from ordinary least square estimation indicate the possible serial correlation in each equation. The DW statistics for import duty, excise duty on import, excise duty on petroleum, VAT on import, and VAT on petroleum are, 0.68, 0.69, 0.33, 1.05, and 1.23 respectively. These are far below 2, therefore residuals are serially correlated.

Using residual correlogram, the residuals are either autoregressive (AR) or moving average (MA) series, and therefore autoregressive moving average (ARMA) approach is appropriate. For autoregressive of order p, AR(p) series, equation (9) in econometric form turns out to be

$$y_t = ax_t^{\mu} + \sum_{j=1}^{p} \gamma_j u_{t-j} + \varepsilon_t \quad (15)$$

The moving average process assumes that the current disturbance term u_t is a weighted sum of the current and lagged innovations ε_t and ε_{t-1} and for the MA(p) series, equation (14) turns out to be

$$y_t = ax_t^{\mu} + \sum_{j=1}^{p} \delta_j \varepsilon_{t-j} + \varepsilon_t \quad (16)$$

The ARMA conditional least square with Gauss-Newton/ Marquardt steps is used in excise duty on import equation only, the rest of equations are estimated using ARMA Generalized Least Square with Gauss-Newton. The Breusch-Godfrey test indicates no serial correlation, as the probability of F-statistics for import duty, excise duty on import, excise duty on petroleum, VAT on import, and VAT on petroleum are about 0.12, 0.18, 0.07, 0.31, and 0.29 respectively. They are all larger than 0.05 which makes the study fail to reject the null hypothesis of no serial correlation for each equation. Nevertheless, a quick look on the DW statistic reveals the possibility of not rejecting the null hypothesis of no serial correlation because they are slightly above or below 2.

The results on the goodness of fit, in Table 1, shows that all the models explain well the variation in the dependant variable. The variation in import duty, excise duty on import, excise duty on petroleum, VAT on import, and VAT on petroleum are explained by about 97.5, 88.3, 94.5, 97.9, and 49.8 percent respectively. The model for VAT on petroleum seems to have a weak explanatory power but still substantially large as it explains about half of the total variation. In the models, except VAT on petroleum with its insignificant constant, all the other variables are statistically significant.

The buoyancy estimates in Table 1 are all statistically very significant at all levels of significance. Excise duty on import is more buoyant with 1.24, followed by excise duty on petroleum with 1.03, VAT on import with 0.87, import duty with 0.67 and VAT on petroleum seems less buoyant with buoyancy estimate of 0.57. These are now used to get elasticity estimates for each tax item using equation 14. The elasticity estimates are given in column 6 of Table 2.

Table 1. Buoyancy Estimation Results

	Import Duty	**Excise Duty on Import**	**Excise Duty on Petroleum**	**VAT on Import**	**VAT on Petroleum**
a	1.72* (1.033)	-8.64***(2.519)	-3.63***(1.191)	-0.62**(0.319)	1.93 (1.615)
µ	0.67***(0.074)	1.24***(0.179)	1.03***(0.086)	0.87***(0.023)	0.57***(0.116)
γ_1	0.73***(0.137)	0.47***(0.116)			0.38***(0.108)
γ_2		0.22* (0.115)			
δ_1			0.90***(0.120)	0.51***(0.085)	
δ_2			0.67***(0.135)		
δ_3			0.22**(.0996)		
R^2	0.975	0.883	0.945	0.979	0.498
$\bar{R}^2$	0.974	0.878	0.942	0.978	0.485
DW	1.95	2.08	1.92	1.84	2.09

Note: ***, **, and * indicates significant at 1, 5, and 10 percent levels of significance. Standard errors are given in parentheses.

From Table 2, given the fact that values in column 4 are all positive but less than unit, their logarithm values must all be negative. Consequently, the ratios in column 2 turn out to be negative. Since, elasticity estimates are obtained by subtracting the ratios in column 2 from the buoyancy estimates in column 5, then all elasticity estimates turns out to have greater values compared to their corresponding buoyancy estimates.
The responses that are due to discretionary tax changes are given in column 2 of Table 2. This portion plus elasticity or automatic response, results into total response which is referred to as buoyancy. From column 2 of Table 2, it is clear that discretionary measures on tax rates have negatively impacted tax revenue for the case of import base in Tanzania. Alternatively, discretionary measures have been highly reduced in the import base in the sample period. Consequently, as levels of import have been increasing, discretionary measures have on the other hand been decreasing. The good part of reducing discretionary measures lies on its influence on automatic increase in tax revenue due to growth in the tax base.

Table 2. Elasticity Estimation Results

Variables	$\vartheta(n)$	$\tilde{\beta}_i$	$D^*(n)$	μ	$\hat{r}$
Import Duty	-0.927	1.6404	0.047347	0.67	1.597
Excise Duty on Import	-1.497	2.5561	0.007269	1.24	2.737
Excise Duty on Petroleum	-1.538	2.7510	0.006353	1.03	2.568
VAT on Import	-1.251	2.2093	0.016313	0.87	2.121
VAT on Petroleum	-0.944	1.6338	0.044801	0.57	1.514

Note: $n\bar{\rho}$ = 1.429, and $\vartheta(n) = log D^*(n)/log[x(n)/x(0)]$

The larger values of elasticity estimates in column 6 of Table 2 indicate that, for the import base, large portion of tax revenue is the outcome of import base growth. The automatic responses of the tax items on tax base are all positive and exceeds unit. Elasticity estimates being above buoyancy estimates seem to contradict most literatures where buoyancy estimates are expected to be larger than elasticity estimates. But in this sample period and for the import base, the automatic responses are greater than buoyancy estimates and probably more contend with overestimation weakness of Divisia Index mentioned early in Gillani (1986). But this should not bring much statistical trouble since buoyancy, which gave birth to elasticity; estimations have not violated the classical procedures.

5. Conclusions

The study used the Divisia Index approach because of the limitations in obtaining information concerning discretionary measures taken by the government. Regardless of the weaknesses mentioned above, Divisia Index is the best approach so far. Positive and large automatic responses of the tax items on the tax base, indicates that by broadening the tax base, more revenue can be realized without necessarily resorting to higher tax rates. Lower tax rate, reduced tax exemption, and increased penalties on tax evasion and tax avoidance can result into higher tax revenue collection that is sufficient to meet growing government expenditure. Broadening import base has a revenue improvement implication in Tanzania. Since the country serves a number of land locked countries in the region, import provides an opportunity for the economy to realize its development agenda of becoming a middle income country by 2025. Good environment for importers like reduced bureaucratic procedures in Dar es Salaam Harbor together with the development of railway and road infrastructure will attract more import and therefore more revenue.

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