TESTING THE HYSTERESIS EFFECT OF TAX REVENUE ON ECONOMIC GROWTH IN NAMIBIA: A POLYNOMIAL DISTRIBUTED-LAG MODEL APPROACH

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ABSTRACT

This study examined the hysteresis effect of tax revenue on economic growth in Namibia. The analyses were carried out using a polynomial distributed-lag modelling (PDL) approach on quarterly data for the period 2001 to 2015. The results showed that the coefficients of the variables measuring the hysteresis effects in the first, third and fourth quarter negatively affect economic growth. These findings validate the generally accepted hypothesis of the negative impact of tax revenue on growth. Therefore, these results revealed that the current value of tax revenue negatively affect economic growth in the Namibian context. The information conveyed by these results simply suggests that, increasing tax rate as means to generate more revenue can result in the opposite effect as economic agents will be left with relatively less income to spend on goods and services.

Keywords: Hysteresis effect, tax revenue, economic growth, Namibia.
JEL classification: H2, H210

1. INTRODUCTION

Gross domestic product can be defined as the market value of all final goods and services produced within a country in a given period of time (Daniel, 2013). While tax is a compulsory payment (imposed upon an individual or legal entity) to government, in exchange for the services indirectly to public by the government (Ahmad, Sial and Ahmad, 2016). The relationship between the two variables has become a center of debate because of increased in pressure on governments to stimulate economic activity. In addition the maximization of tax revenue is incompatible with the maximization of gross domestic product because of the argument that high taxes are bad for economic growth (Yi and Suyono, 2014).

The current situation in which Namibia finds itself is typical of what has been described above. That is to say the financial situation has put the government under enormous pressure, yet there is a need for the economy to grow. Historically, Namibia has had sustained gross domestic product (GDP) growth since the global economic crisis in 2009. This growth has been supported by a countercyclical fiscal policy because of the absence of discretionary monetary policy for being a member of the common monetary area (CMA)[1]. In particular, real GDP stood at 5 percent in 2012 despite the global turbulence and slowed down by 0.8 percent in 2013, while picked up slightly to 4.3 percent in 2014 (Honde and Odhiambo, 2014). It follows that the use of fiscal policy has complications because of issues of

[1] The CMA was formerly known as the Rand Monetary Area, which consisted of Botswana, Lesotho, Swaziland and South Africa. Botswana moved out in 1976 and Namibia joined in 1990 after attaining independence. The CMA is now comprised of the following members: Lesotho, Swaziland, Namibia and South Africa.

sustainability which is largely dependent on the current levels of both domestic and foreign debts as well as government's willingness to tax and impose aggressive measures (Rena and Kafele, 2011). According to the authors, taxation is the only mean through which government can rationally raise funds for spending on goods and services. However, there are other sources such as income from state property and enterprises, proceeds of the sale of government assets, and grants from other governments and international institutions (Daniel, 2013).

There is a lot ambiguity on the effects of taxation on economic growth. However, in general, it is maintained that increasing taxation has a negative effect on the economy. It is for this reason it is argued that the demand side is the real foundation for an expanding economy (Freeman, 2006). On the contrary, Namibia seem to follow the supply side as it is evident in that 51 percent of Namibian state revenue is accrued from regressive indirect taxes like the value added taxes (VAT) and import taxes (Rademacher and Stiftung, 2011). Consequently, this could further exacerbate additional inequality resulting from the use of regressive tax. In particular, this take away from the poor and lower earners, that 'extra dollar' that only the wealthy can afford to invest, making the tax regime and form very unfavourable (Jauch, Edwards and Cupido, 2009). Therefore, there is a need to investigate how the revenue accrues from the supply side orientation in Namibia has affected growth, through the analysis of the relationship between taxation and economic growth.

The paper is organized as follows: the next section presents a literature review. Section 3 discusses the methodology. The empirical analysis and results are presented in section 4. Section 5 concludes the study.

2. LITERATURE REVIEW

There are numerous theories developed to explain the impact of taxation and government spending on economic growth. The demand theory which is based on Keynes stipulates that economic policy that supports consumption should be based on direct taxes. These are progressive taxes whose proportion of tax payment increases with income.

The supply theory is based on the neoclassical and advocates for increase in aggregate supply in order to achieve long term growth in real output, full employment and reduced levels of inflation. Unlike the Keynesian, their argument is based on regressive tax. These are tax payments that take a larger percentage from low-income people than from high-income people. Furthermore, a regressive tax is generally applied uniformly. It follows that these policies are based on the notion self-regulating market and that state intervention should only be adopted when the market has negative externalities such as environmental damage (Tucker, 2010; Rademacher and Stiftung, 2011).

The implication for the supply side theory is that it results in an unequal redistribution as it only to the advantage of the suppliers (with the have getting more and have not getting less). This is due to the fact that tax cuts benefits the wealthy since they are the only ones who can afford to use the extra income to invest in the economy. This is contrary to the demand side theory, which advocates for the tax cuts to benefit those that earn the least in the economy. That is why it can be argued that the demand theory can result in better redistribution because the low income workers spend all their income and thus, money goes back into circulation, which in turn, enhances consumer spending (Freeman, 2006).

Babatunde, Ibukun and Oyeyemi (2017) also discussed additional theories of taxation such as the benefit theory of taxation, the cost of service theory of taxation, ability to pay theory of taxation, sacrifice theory of taxation, Ibn Khaldun's theory and optimum theory of taxation. According to Cooper (1994), the benefit theory of taxation postulates that a taxpayer should pay a tax corresponding to the benefit derived from the government activities or spending. However, the problem with this hypothesis is that it is very difficult to quantify the individual benefit derived. In terms of welfare, the implementation of this theory would largely disadvantage the poor as they would pay the heaviest taxes. This is because they benefit more from public services (Young, 1995). On the contrary, the cost of service theory of taxation posits that a taxpayer should be taxed on the basis of the cost of service rendered by it. The theory simply equates the tax paid or to be paid with cost of the benefit (cost-benefit postulation) (Kennedy, 2012). A complimentary theory is the ability to pay theory by Pigou (1920) which suggests that every citizen should pay taxes based on their ability to pay. The theory is almost similar or synonyms with the principle of equity or justice in taxation in support of government expenditure. This is because under this principle higher income earners should pay more taxes than lower income earners. The shortfall of this theory is that the high income earners sacrifice more to allow for equitable distribution of incomes (Mankiw, 2008; Makinya, 2000).

The Ibn Khaldun"s (1332 to 1406) theory on taxation as adopted by Islahi (2006) identifies two different effects namely, the arithmetic and the economic effect, which the tax rates have on revenues. The aforementioned effects have opposing outcomes on revenue depending whether the rates are increased or decreased. For example, with the arithmetic effect, lowering tax rates are lowers tax revenues by the amount of the decrease in the rate and vice versa. However, with the economic effect, lower tax rate have a positive effect on work, output and employment. In validation of the theory is the optimum tax theory advocated by (Mirrlees, 1971). This theory advocates for a specific tax rate at which a given amount of government revenue can be raised, without or with minimum distortion in an economy. This is done with intentions of achieving social efficiency through a desired adequate income distribution and/or improved welfare.

There is plenty of empirical literature on the relationship between tax and economic growth. Engen and Skinner (1996) re-examined the relationship between economic growth and taxation for USA and other countries for the period of 1970 to 1985 using cross sectional data. The results revealed that high taxes hurt economic growth. Therefore, it is in-line with theory that high taxes are bad for growth while lower taxes positively affects economic growth. Similarly, Poulson and Kaplan (2008) explore the impact of tax policy on economic growth in the United States within the framework of an endogenous growth model. Regression analysis was used to estimate the impact of taxes on economic growth in the states for the period 1964 to 2004. The results revealed a significant negative impact of higher marginal tax rates on economic growth.

In Sweden, Forbin (2011) examined the effect of corporate income tax on GDP growth rate using historical data for the period 1951 to 2010. The results showed that corporate income tax rates have no significant effect on Swedish economic growth. Using a different approach, Acosta-Ormaechea and Yoo (2012) investigated the relation between changes in tax composition and long-run economic growth using a broad cross-section of countries with different income level. They considered 69 countries with at least 20 years of observations on total tax revenue during the period of 1970 to 2009. This consisted of 21 high-income, 23 middle-income and 25 low-income countries. The study showed that increasing income taxes,

reduction in consumption and property taxes is associated with slower growth in the long run. Specifically, social security contributions and personal income taxes have a stronger negative association with growth than corporate income taxes. Moreover, a shift from income taxes to property taxes has a strong positive association with growth, while a reduction in income taxes, increasing value added and sales taxes are also associated with faster growth.

A study by Worlu and Emeka (2012) also examined the impact of tax revenue on the economic growth of Nigeria via infrastructural development for the period 1980 to 2007. The study employed a three stage least square estimation technique and showed that tax revenue stimulates economic growth through infrastructural development. Furthermore, the study also revealed that tax revenue has no independent effect on growth through infrastructural development and foreign direct investment, but just allowing the infrastructural development and foreign direct investment to positively respond to increase in output. Another study conducted on a developing country was by Takumah (2014) who investigated the effect of tax revenue on economic growth in Ghana. This study employed a vector autoregression modelling technique on quarterly data for the period 1986 to 2010. The findings are that there exist both short run and long run relationship between economic growth and tax revenue. Furthermore, the result showed a unidirectional causality running from tax revenue to economic growth. The result also revealed that tax revenue exerted a positive and statistically significant effect on economic growth both in the long-run and short-run, thus, enhances economic growth in Ghana. The study recommended for a widening of a tax base and a reduction of tax rates to generate more revenue.

In China, Yi and Sunyono (2014) examined the relationship between tax revenue and economic growth for the period of 1978 to 2011 in the Hebei province. The study employed the ollowing techniques namely, the tax multiplier and the polynomial distributed lag (PDL) modelling techniques. The results showed a negative impact of tax revenue on growth, while tax cuts create more positive effects. These results are in-line with standard literature on the effect of tax revenues. On the same subject but taking a different approach was Macek (2014) study which evaluated the impact of individual types of taxes on the economic growth by utilizing regression analysis on the OECD countries for the period of 2000 to 2011. The results also showed that corporate taxation followed by personal income taxes and social security contributions are the most harmful for economic growth. Simultaneously, the value added tax approximated by tax quota rejected the hypothesis of negative impact on economic growth. When utilizing the World Tax Index, a negative relation between taxes and economic growth exists though least quantifiable. Moreover, the impact of property taxes was statistically insignificant. Another study looking at cross-country assessment is that of Babatunde, Ibukun and Oyeyemi (2017), who examined the impact of taxation on economic growth in Africa. The study used panel modelling technique on data for the period 2004 to 2013. The results from the study revealed a positive relationship between real gross domestic product in the African context.

Lastly, Nkhalamo and Sheefeni (2017) analysed the relationship between taxation and economic growth in Namibia. The study employed time-series techniques such as unit root, cointegration, impulse response functions and variance decomposition on quarterly data for the period 2001 to 2015. The results revealed an immediate negative effect on economic growth resulting from shocks in tax.

From the literature review brought to the fore, it is evident that there exists a relationship between taxes and economic growth. In particular, an increase of taxes has a negative impact

on economic growth and the opposite is true. More so, reduction in taxes for corporations encourages investment which in turn, results in economic growth. However, significance of the negative correlation between taxes and economic growth varies from country to country. In the case of Namibia, the only study that comes close to the issue of taxation and economic growth Nkhalamo and Sheefeni (2017). However, their study was merely looking at the general effect taxes on economic growth. The point of departure of this study is that it is specifically testing for tax hysteresis or better known as the negative effects of tax lagging using the polynomial distributive lag model. So far there is no previous study that has specifically investigated tax hysteresis using the polynomial distributive lag (PDL) model. Therefore, this study intends to fill this gap.

3. METHODOLOGY

3.1 Empirical Framework and Model Specification

In analyzing hysteresis effect of tax revenue on economic growth in Namibia, the paper adapts a polynomial distributive lag (PDL) model as used by Yi and Suyono (2014). The theoretical basis of this analytical framework draws from Keynes (1936) who postulates that growth of taxation has negative influence on gross domestic product. Furthermore, the Keynesian's tax multiplier theory also postulates that tax revenue (T) impacts the current economic growth (G) and the impact continues for several periods by changing consumptions. Accordingly, a polynomial distributed-lag (PDL) model is the finite *p th-order* distributed-lag model which also assumes that economic growth depends on the tax revenue in the current period as well as in the preceding periods. It can be expressed as follows:

$$LNG_t = \alpha + \beta_0 LN_t + \beta_1 LN_{t-1} + \beta_2 LN_{t-2} + \beta_3 LN_{t-3} + \cdots + \beta_p LN_{t-p} + \mu_t + [AR(1)] \quad \ldots 1$$

where LNG_t is economic growth, α is the value of LNG_t if $\beta_1, \beta_2, \beta_3, \beta_4, \beta_p = 0$, $\beta_1, \beta_2, \beta_3, \beta_4, \beta_p$ are regression coefficients, LNT_t is the current tax revenue, LNT_{t-p} is the p *th-lag* hysteresis effect of tax revenue and μ_t is the residual value. The log transformation enhances the data more interpretable and also makes them meet the assumptions of inferential statistics. So, the study uses LNG and LNT whose coefficients represent elasticity. The hypothesis testing is conducted using the t-test with the following formula:

$$t = \frac{b_j}{S_{bj}} \quad \ldots 2$$

where t = value obtained from the calculation, b_j is the coefficient of regression, S_{bj} is the standard error of regression coefficient. The criteria of hypothesis testing are as follows: H_0: $\beta_1, \beta_2, \beta_3, \beta_4, \beta_p = 0$ while H_1: $\beta_1, \beta_2, \beta_3, \beta_4, \beta_p \neq 0$. Thus, it follows that the null hypothesis H_0 would be rejected if the calculated *t-statistic* is greater than $t_{\frac{\alpha}{2}}(\mathrm{n} - \mathrm{p} - 1)$ and the opposite applies. In the Almon scheme, the regressand (Y) is regressed on the constructed explanatory variables (Z) and not on the original regressors (X).

$$LNG_t = \alpha + \alpha_0 Z_{0t} + \alpha_1 Z_{1t} + \alpha_2 Z_{2t} + \alpha_3 Z_{3t} + \cdots + \alpha_p Z_{pt} + \mu_t + [AR(1)] \quad \ldots 3$$

Equation (3) can be estimated using the usual ordinary least squares (OLS). Once the $\alpha's$ are estimated from equation (3), the original $\beta's$ can also be estimated. The Z variables are most likely to exhibit multicollinearity thus, it is expected that one or more such coefficient will be statistically insignificant on the basis of the conventional t test. However, this does not necessarily imply that this will be so on the original coefficients (Gujarati and Porter, 2009). It also follow that the estimated $\alpha's$ the original values of $\beta's$ can be obtained as follows:

$$\beta_0 = \alpha_0$$

$$\beta_1 = \alpha_0 + \alpha_1 + \alpha_2 + \alpha_3 + \alpha_4 + \cdots + \alpha_p$$

$$\beta_2 = \alpha_0 + 2\alpha_1 + 4\alpha_2 + 8\alpha_3 + 16\alpha_4 + \cdots + \alpha_p$$
$$\beta_3 = \alpha_0 + 3\alpha_1 + 9\alpha_2 + 27\alpha_3 + 81\alpha_4 + \cdots + \alpha_p$$
$$\beta_4 = \alpha_0 + 4\alpha_1 + 16\alpha_2 + 64\alpha_3 + 256\alpha_4 + \cdots + \ldots \alpha_p$$
$$\beta_p = \ldots \alpha_0 + \ldots \alpha_1 + \ldots \alpha_2 + \ldots \alpha_3 + \ldots \alpha_4 + \cdots + \ldots \alpha_p$$

Prior to the estimation of the polynomial distribution lag model one need to establish the optimal lag length for the model. These can be established using the several lag length criterion namely, the Akaike or Schwarz information criterion to choose the appropriate lag length. Consequently, the degree of the polynomial model can be determined following the norm of starting with a large value and then reducing it (Davison & Mackinnon 1993).

3.2 Data and Data sources

The study used secondary data of quarterly frequency for the period 2001 to 2015. The data for tax revenue (T), the independent variable was sourced from the Ministry of Finance, while for gross domestic product (G), the dependent variable was sourced from Namibian Statistical Agency and Bank of Namibia publications.

4. EMPIRICAL FINDINGS AND DISCUSSION

4.1 Unit Root test

Table 1: Unit root test in levels, first and second difference.

Variable	Model Specification	ADF Level	PP Level	ADF First Difference	ADF Second Difference	PP First Difference	Order of Integration
LNDT	Intercept	-0.127	-0.934	-1.958	-7.363**	-7.632**	2
	Intercept and Trend	-1.958	-1.993	-7.563**	-7.292**	-7.564**	1
LNDG	Intercept	-0.940	-0.376	-11.847**	-6.489**	-25.802**	1
	Intercept and Trend	-7.419**	-7.426**	-11.726**	-6.426**	-25.694**	0

Source: Authors compliance and values from Eviews
*Note: ** means the rejection of the null hypothesis at 5%.*

In testing for the univariate characteristics of the time-series properties, this study applied two tests namely, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. The results of the of the unit root are presented in table 1. Specifically, the result reveals that the variable LNDT became stationary in second difference when considering intercept model specification, while stationary in first difference when considering intercept and trend model specification. The variable LNDG was found stationary in first difference when considering intercept model specification, while stationary in level when considering intercept and trend model specification.

4.2 Optimal Lag Length Criterion

Upon establishing the statistical properties of the time-series, the next step was to determine the maximum lag length of the model. This was conducted on the basis of the roots of the characteristic polynomial and was found to be 4 as suggested by the majority of lag length criterion as shown in table 2. This was necessary prior to the estimation of the polynomial distribution lag model in order to establish the optimal lag length for the model.

Table 2: Optimal Lag Length

Lag	LogL	LR	FRE	AIC	SC	HQ
0	-104.494	NA	0.177	3.944	4.018	3.973
1	3.370	203.743	0.004	0.097	0.318	0.813
2	9.038	10.286	0.004	0.036	0.404	0.178
3	11.894	4.972	0.004	0.078	0.594	0.277
4	28.060	**26.944***	**0.002***	**-0.373***	**0.290***	**-0.117***
5	31.316	5.185	0.002	-0.345	0.465	-0.033

** indicates lag order selected by the criterion*

4.3 Polynomial Distributed-Lag Model

Table 3: Regression Model

Variable	Coefficient	Standard Error	t-Statistic	p-value	Conclusion
Constant	24.64545	1.125512	21.89710	0.0000	Significant
LNT	-0.004111	0.009604	-0.428098	0.6705	Insignificant
LNT(-1)	-0.010280	0.009605	-1.070295	0.2900	Insignificant
LNT(-2)	0.004508	0.009607	0.469207	0.6411	Insignificant
LNT(-3)	-0.002573	0.009607	-0.267871	0.7900	Insignificant
LNT(-4)	-0.006338	0.036739	-0.660264	0.5123	Insignificant

The estimated distributed-lag model: $LNGDP = 24.645 - 0.004LNT - 0.010LNT(-1) + 0.005LNT(-2) - 0.003LNT(-3) - 0.006LNT(-4) + [AR(1) = 0.973]$

The results of the PDL model show that the coefficient of determination (R^2) is 0.89. This suggests that the total variation within the regressand explained by the regressors is about 89%. Thus, the current and hysteresis effects of tax revenue explain the variation GDP.

The results further reveals that the current value of tax revenue has a negative effect on economic growth, though statistical insignificant. In particular, if tax revenue increases by 1%, GDP will decline by 0.004%. Similarly, the coefficients of the variables of hysteresis effects in the first, third and fourth quarter have the values of -0.0103, -0.0045 and -0.0063 respectively. This is to say, a 1% increase in tax revenue in the first quarter will reduce GDP by 0.010% in the first quarter, 0.005% in the third quarter and 0.006% in the fourth quarter. These findings are similar to those of Yi and Suyono (2014). Notably, all the coefficients are statistically insignificant. The results for this study validate the general understanding of the negative impact of tax revenue on growth. This is simply to say, increasing tax rate with hope to generate more revenue can be more detrimental, while tax cuts create more positive effects. These results are in-line with standard literature on the effect of tax revenues.

5. CONCLUSION

This study examined the hysteresis effect of tax revenue on economic growth in Namibia. This was necessitated by the contradiction arising from the different schools of thoughts. The study employed a polynomial distributed-lag modelling approach using quarterly data covering the period 2001 to 2015. Other relevant time series techniques were also employed where appropriate. The findings for the unit root test showed a combination of different order of integration ranging from levels to second difference. Since this is a distributed-lag model, it was necessary to determine the optimal maximum lag length for the model which was found to be four. The results further reveals that the current value of tax revenue has a negative effect on economic growth, though statistical insignificant. Similarly, the

coefficients of the variables of hysteresis effects in the first, third and fourth quarter also negatively affect economic growth. These findings validate the generally accepted hypothesis of the negative impact of tax revenue on growth. Therefore, on the basis of these findings the study caution that increasing tax rate meant to generate more revenue can result in the opposite effect as economic agents are left with relatively less income to spend. Thus, the study recommends that the government of Namibia should not use such method as means of revenue maximising mechanism as it depolarise the poor more.

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