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An Analysis of the Impact of Fiscal Policy on Income Distribution in Namibia

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Abstract: This research analyses the statistical relationship between income distribution and seven taxation and government expenditure components in the Southern African country, Namibia, using data from 1996-2016. The research is aimed at creating new knowledge on the research topic because no literature exists for Namibia on this. The Autoregressive Distributed Lag (ARDL) cointegration technique was employed to assess the long-run relationship between the dependent and independent variables. The research findings indicated that there is no long-run relationship between the dependent variable, income distribution, and the relevant independent variables. In the short-run, the research findings indicate that government expenditure on social pensions and government expenditure on education has a balancing or reducing effect on income distribution, while a tax on products, corporate income tax, and customs and excise duties have an unbalancing and/or worsening effect on income distribution. Based on these findings, tertiary education loans are recommended as opposed to grants to ensure the sustainability of the Namibia Students Financial Assistance Fund (NASFAF). In adjusting corporate and value-added taxes, the government is cautioned to avoid overburdening consumers and employees through tax shifting in the form of high prices of goods and services and low wages and benefits. A tax mix, tax discrimination, and a hybrid of taxation and government expenditure components are strongly recommended to achieve a balance and the sustainable development goal (SDG) of reduced income inequality.

Keywords: Income distribution; fiscal policy; taxation; government expenditure; Namibia

JEL Classification: O110

1. Background to Income Distribution and Fiscal Policy in Namibia

This section presents an outline of the fiscal policy and the current state of income distribution in Namibia. Before proceeding, the global perspective is painted. Income inequality is a global challenge that affects all countries in the world.

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However, the degree of inequality differs from country to country and continent to continent. Various researchers and scholars indicate that the world income is unequally distributed and that this inequality occurs within countries, between countries, and between continents. Kuznets (1980) indicates that the three underdeveloped continents of the world, namely Latin America, Africa, and Asia, account for more than 60 percent of the world's population but account for less than 30 percent of the world's income. Table 1 below depicts the distribution of income according to different household quantiles.

Table 1. Income Distribution of Selected Countries

Households (quantile)	**Percentage of total income**		
	Brazil and South Africa	**United States**	**Finland and Sweden**
Lowest	2	5	8
Second	5	11	14
Third	10	16	20
Fourth	18	24	23
Highest	65	44	35

Source: Parkin (2016)

According to the African Development Bank Group (2017), Africa has the highest income inequality in the world with an average Gini index value of 43, while Europe has the lowest income inequality. At the country level, South Africa, Colombia, Namibia, Botswana, Brazil, Honduras, and Chile are among countries with the highest income inequalities in the world, with an average Gini index value above 50. Countries with the Gini index value of 30 and above but less than 50 are considered as medium Gini coefficient countries. These countries include Russia, Vietnam, Argentina, Mexico, Uruguay, Poland, and the United States. Countries with a Gini coefficient below 30 are considered as low Gini index countries, and these countries include Norway, Denmark, Austria, Slovenia, Germany, Sweden, and Ukraine, among others. The causes of income inequalities differ from continent to continent and country to country.

When the first democratically elected government took over on 21 March 1990, Namibia was faced with several challenges such as a much-skewed distribution of income (with the Gini coefficient greater than 70), a low level of education and a large element of unskilled labour. Education and training are some of the determinants of income inequality. It is worth noting that income inequality has reduced since independence, though at a snail's pace. This is evident from Figure 1 below.

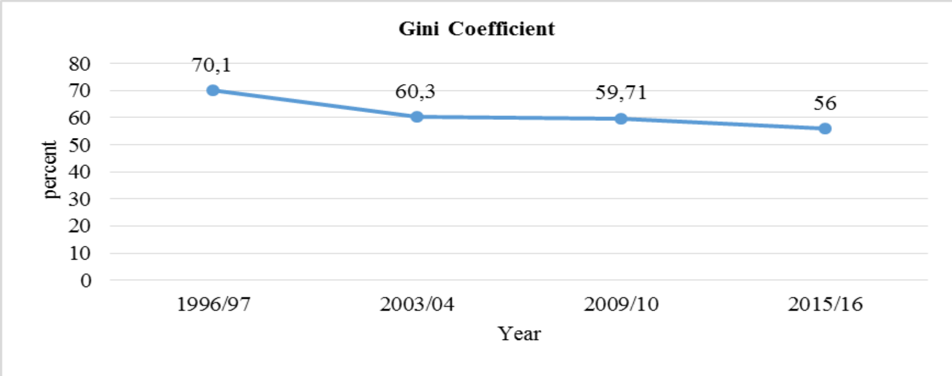

Figure 1. Gini Coefficient Trend

Source: Author's depiction using data from Namibia Statistics Agency

From independence in 1990, some income redistribution initiatives and policies were put in place to redress the wrongdoings of the former colonial apartheid government. These policies and initiatives include the Black Economic Empowerment (BEE), the Affirmative Action Act, the National poverty reduction strategy, the Zero Hunger challenge, etc. These policies and initiatives are incorporated in the national development planning (NDP) agenda of the government (National Planning Commission). The government objectives and plans are strategically implemented and cascade from Vision 2030 to the NDP's strategic, annual, and quarterly plans to individual quarterly and monthly plans.

From data (Ministry of Finance website), it can be observed that government expenditure on education and health has more than tripled over the past 14 years and this can be attributed to the growing population, which leads to an increased demand for government education and health services. Statistics indicate that taxes, customs, and excise duties are the main source of the Namibian government revenue, contributing more than 95 percent of government revenue. Government expenditure on social pensions has more than doubled over the past six years due to some factors, of which the main one is highlighted. Firstly, the sharp increase in government expenditure on social pensions is due to an increase in the proportion of the population that is receiving social pensions. Secondly, the sharp increment can be attributed to an 83.33 percent increment in the old age pension in 2015. In general, the government has made some strides in reducing income inequality as indicated by the declining Gini coefficient throughout 1996-2016. However, more needs to be done to bring the Gini coefficient to an acceptable level.

2. Literature Review

This section presents the empirical literature review of the work by various researchers and scholars whose empirical research has relevance to the analysis of the impact of taxation and government expenditure components on income inequality in Namibia. The empirical literature is demarcated according to the method of study. This section is designed to provide an in-depth understanding of the research topic from the empirical analysis point of view and to provide the empirical foundation/footing of this research.

Various scholars and researchers have analysed the impact of taxation and government expenditure components on income distribution, with most of the empirical findings indicating that taxation and government expenditure components are statistically significant in influencing income inequality in general. Leu, *et al.* (2009) researched to analyse the impact of government policies on income distribution in Switzerland using the Budget incidence approach. In conducting their investigation, Leu, *et al.* (2009) used data from the first nationwide representative Income and Wealth Survey. The findings of their research indicate that government expenditures are more effective in redistributing national income as opposed to direct taxes. Social welfare expenditures were found to be more effective in redistributing national income as opposed to other government expenditures. Their research further indicates that indirect taxes have an unbalancing effect on the distribution of income.

Regarding government expenditure on education, Tsanos and Manos (1999) conducted empirical research on the distributional impact of government education expenditure in Greece using micro-data of the 1987/88 Greek Household Budget Survey which was conducted by the National Statistical Service of Greece. Tsanos and Manos (1999) segmented the education component into three segments, namely, primary, secondary and tertiary education. Secondary education was further segmented into lower-secondary education and upper-secondary education while tertiary education was further segmented into higher education institutions and technical education institutions. Tsanos and Manos (1999) employed hedonic regression techniques to estimate their model. The research findings indicate that government expenditure on primary and secondary education is undoubtedly significant in reducing inequality on aggregate. Education expenditure on tertiary education was found to have an unbalancing/regressive effect on inequality.

The effects of education expenditure on income inequality have been researched widely by various researchers, and most of the findings undoubtedly indicate a balancing effect on income inequality. Sylwester (2002) researched the effects of government expenditure on education on income inequality using cross-sectional data of a selected number of countries. In analysing the effects of government expenditure, Sylwester (2002) used the Gini coefficient as a proxy for income inequality and the empirical research findings indicate that countries whose governments devote more financial resources to education as a percentage of GDP experienced lower income inequality in subsequent years. In conducting the research, Sylwester (2002) employed the least square regression method and White's correction for heteroscedasticity. The findings of the research undoubtedly indicate that government expenditure on education has a balancing effect on income inequality in both developed and developing countries. Sylwester (2002) concluded that allocating more government resources to the education sector will lead to a reduction in income inequality.

Another research conducted by Vaalavuo (2013) indicated that social expenditure by the government has a balancing effect on income inequality. Vaalavuo (2013) conducted empirical research on the re-distributional impact of traditional and modern/new social expenditure by the governments of six selected European countries, namely, France, the Netherlands, Slovenia, United Kingdom, Spain, and Denmark. The research employed the imputation method as an estimation tool. The findings of the empirical research by Vaalavuo (2013) indicate that traditional social expenditure by government, e.g. old age cash benefits or social pensions, is effective in reducing income inequality because it is directed towards the bottom income quintiles as opposed to the new social expenditure methods. The research findings further indicate that the inclusion of government services in the model further reduces income inequality.

The existing theories of taxation suggest that taxation is very effective in reducing income inequality and that labour taxes are effective in reducing income inequality, as opposed to consumption taxes. This theory is supported by the empirical research findings of Mylonidis and Losifidi (2017), in which they analysed the redistributive effects of taxation using a panel of 17 Organisation for Economic Co-operation and Development (OECD) countries over 31 years. In conducting their research, they employed the two-stage least squares estimation method. The findings of the research by Mylonidis and Losifidi (2017) indicate that direct taxes such as progressive income taxes/labour taxes are effective in reducing income inequality, as opposed to consumption taxes such as value added tax or general sales tax. In conducting their empirical research, Mylonidis and Losifidi (2017) identified and analysed tax rates that are comparative among across the selected OECD countries with the view to levelling the playing field. The primary focus of their research was to analyse how a change in the combination of different tax rates, namely, labour, consumption, and capital taxes affect inequality in OECD countries. Concerning the change in the tax mix, the research findings indicate that an increase in the tax burden on labour relative to capital leads to an increase in income inequality. Increasing the tax burden on consumption relative to capital was also found to have an unbalancing effect on income inequality. The research findings further indicate that income equality improves with an increase in the tax burden on labour relative to consumption. The research findings indicate that the distributive power of labour taxes is very significant in reducing income inequality. The research findings of Mylonidis and Losifidi (2017) indicate that a tax mix is more effective in reducing inequality and poverty as opposed to one specific tax in general. On that basis, Mylonidis and Losifidi (2017) recommend a tax mix as an effective income redistribution measure as opposed to one specific tax. The research findings also reveal that the gap between the poor and the rich has widened over the past three decades in OECD countries.

Researchers and scholars have generally accepted that the gap between the poor and the rich has increased over the past decades. Research by Wittenberg (2017) on the wages and wage inequality in South Africa substantiated this claim. Wittenberg (2017) used 1994-2011 data from October Household Surveys and Quarterly Labour Force Surveys. To deal with measurement issues such as outliers, bracket data, and missing values, Wittenberg (2017) used three procedures, namely, the BACON algorithm for outlier detection, extreme stundentised regression residuals and robust regression. These procedures ensure data quality and reliability of the results. Wittenberg (2017) pointed out that it is not possible/sufficient to read wage trends from raw data without applying various data adjustment methods. Data quality adjustment approaches considered by Wittenberg (2017) include the mid-point imputation, reweighting, multiple imputations, hot deck, point and mean imputation approach. The empirical research findings of Wittenberg (2017) indicate that inequality in earnings among employees in South Africa has increased between 1994 and 2011. Considering that the labour markets of South Africa and Namibia are closely intertwined, the same assumption can be made for Namibia. However, empirical research will be required to substantiate this statement.

Most economists and researchers generally accept the effectiveness of taxation and government expenditure policies in reducing income inequality. Martinez-Vasquez, Moreno-Dodson, and Vulovic (2012) cement this notion with the research findings on 'the impact of Taxation and Expenditure policies on income distribution'. Martinez-Vasquez., *et al.* (2012) indicate that taxation policy is statistically significant in reducing income inequality. In conducting their analysis, Martinez-Vasquez., *et al.* (2012) employed the generalised method of moments approach (GMM) which is considered appropriate for research of that nature. The research conducted by Martinez-Vasquez., *et al.* (2012) indicates that taxes and government expenditure have a significant effect on income distribution. The research is based on data from a sample of 150 countries over 36 years from 1970-2006. Martinez-Vasquez., *et al.* (2012) indicate that when progressive income taxes are considered separately, they tend to have a balancing/improvement effect on income inequality, leading to decrease inequality. The research further indicates that general consumption taxes (e.g. tax on products), excise, and customs duties have an unbalancing effect on the distribution of income. On the expenditure side, the research findings indicate that large proportions of GDP on social welfare activities, education services, health services have a balancing/improvement effect on the distribution of income, both individually and collectively. It should however be noted that different countries may have different empirical results for similar variables because each country has different economic and environmental factors that may influence the relevance of each variable.

3. Methodology and Empirical Results

The ARDL bounds test approach to cointegration was employed for this study. The dependent variable for this research is the Gini coefficient (G), which is the proxy/measure of income inequality. On the taxation side, the independent variables for this thesis are a tax on income and wealth (TIW), tax on products (TP), corporate income tax (CIT) and customs and excise duty from SACU (CE). On the expenditure side, the independent variables are government expenditure on social pensions (GESP), government expenditure on education (GEE), and government expenditure on health (GEH). The research employed the linear log regression model as used by Manning and Mullahy (2001). This research is a modified version of empirical research conducted by Leu, *et al.* (2009), titled "Taxes, expenditures and income distribution in Switzerland". In their research, Leu, *et al.* (2009), analysed the impact of government policies on income distribution and poverty in Switzerland. In conducting their investigation, (Leu, *et al.* 2009), used mainly data from the first countrywide representative Income and Wealth Survey. The findings of their research indicate that government expenditures are more effective in redistributing national income as opposed to direct taxes. Social welfare expenditures were found to be more effective in redistributing national income as opposed to other government expenditures. Their research further indicates that indirect taxes have an unbalancing effect on the distribution of income. This research is modified to focus specifically on the impact of taxation and expenditure components on income distribution in Namibia. The empirical model that was used in undertaking this research is specified in a functional form as follows:

$$G = f\,(GESP, GEE, GEH, TP, TIW, CE, CIT) \quad (1)$$

Equation (4.1) above is expressed in an econometrics equation as specified below:

$$Ge_t = \beta_0 + \beta_1 GESP_t + \beta_2 GEE_t + \beta_3 GEH_t + \beta_4 TP_t + \beta_5 TIW_t + \beta_6 CE_t + \beta_7 CIT_t + \varepsilon_t \quad (2)$$

Where:

G = Gini coefficient

GESP = Government Expenditure on Social Pensions

GEE = Government Expenditure on Education

GEH = Government Expenditure on Health

TP	=	Tax on Products/VAT
TIW	=	Tax on Income and Wealth
CE	=	Customs and Excise duties from SACU
CIT	=	Corporate Income Tax
ε	=	Stochastic error term
$\beta_{'s}$	=	Coefficients
t	=	Time/period

β_1 to β_7 represents the coefficients of the independent variables and they determine how much the independent variables affect the dependent variable in this research. Time series data is considered to be affected by heteroscedasticity if the variance of the error term of an OLS is not constant. In the presence of heteroscedasticity in the time series, the standard error becomes biased, thereby affecting the confidence interval and the test statistics. Berry and Feldman (1985) indicate that minor heteroscedasticity may have little effect on significance tests. However, enormous heteroscedasticity can lead to a serious misrepresentation of the research findings, thereby compromising the analysis and increasing the possibility of a Type I error. Manning and Mullahy (2001) indicate that transforming an equation into a natural log can reduce heteroscedasticity, and therefore equation three (4.3) is converted into a natural log as formulated below with the prime purpose of reducing heteroscedasticity. This method helps to estimate the variables in the same form and makes the interpretation of the results easy and simple. The natural log equation is specified as follows:

$$lnG_t = \beta_0 + \beta_1 lnGESP_t + \beta_2 lnGEE_t + \beta_3 lnGEH_t + \beta_4 lnTP_t + \beta_5 lnTIW_t + \beta_6 lnCE_t + \beta_7 lnCIT_t + \varepsilon_t \quad (3)$$

The Ordinary Least Squares method alone would not yield the desired results; therefore, the research employed appropriate techniques to test the stationarity property of the variables in the model. The DF-GLS and the Phillips-Perron (1988) unit root tests are employed to test the stationarity property of the variables in equation 4.3 above. The research used the ARDL approach to estimate the parameters in equation 4.3 above. The research also employed the bound test to test for cointegration and the Wald test to test for the significance of the variables. The research employed the Breusch-Godfrey serial correlation LM test, the Jarque-Bera normality test, the Autoregressive Conditional Heteroscedasticity test (ARCH test, and the normality test to assess the robustness of the model. The Granger causality test was also conducted to establish the causal relationship between the Gini coefficient and its explanatory variables.

The variable to the left-hand side of the equation (G) is the dependent variable while the variables on the right-hand side of the equation (GESP, GEE, GEH, CE, TP, TIW, and CIT) are the independent variables. The stochastic error term (ε_t) on the equation above represents the effects of the variables that were omitted from the equation, which are assumed to have a mean value of zero and to be uncorrelated to the independent variables.

This research used a quantitative research method using the dataset which comprises 21 data points at a yearly frequency for all the variables. Data extrapolation was conducted by transforming annual frequencies to quarterly frequencies in E-views. Secondary data was obtained and analysed to create new knowledge on the research topic. Data for tax on income and wealth, tax on products, and tax on corporations was collected from NSA, National Accounts. Data on government expenditure on social pensions were obtained from various publications of the Bank of Namibia (Research Department), Ministry of Finance (MoF), Ministry of Poverty Eradication and Social Welfare and Ministry of Labour and Industrial Relations. To have a complete set of data for the desired time series, some data were collected from the United Nations (United Nations Development Programme). Data for the Gini coefficient was obtained from NSA (Namibia Household Income and Expenditure Surveys) while data for customs and excise duty was obtained from SACU annual reports. Data for government expenditure on education and health was obtained from the Bank of Namibia, Ministry of Education, and Ministry of Health.

3.1. Stationarity Test Results

The Dickey-Fuller Generalised Least Squares (DF-GLS) and the Phillips-Perron Tests were employed to test the stationarity property of the variables, firstly, at the level and secondly, at first difference. The null and alternative hypotheses for the stationarity tests are specified as follows:

$H_{0:}$ The series has a unit root (non-stationary)

$H_{1:}$ The series has no unit root (stationary)

The null hypothesis is rejected if the absolute value of the test statistic is greater than the critical value in absolute terms. The Dickey-Fuller Generalised Least Squares (DF-GLS) and the Phillips-Perron Test results are summarised in Table 5.1 below:

Table 2. Dickey-Fuller Generalised Least Squares and the Phillips-Perron Stationarity Tests Results

Variable	Model	DF-GLS		Phillips-Perron Test (PP)		Decision
		Levels	First Difference	Levels	First Difference	
LNG	Intercept Trend & Intercept	-0.737 -2.286	-4.684*** -4.727***	-0.860 -2.165	-4.622*** -4.472**	I(1)
LNGESP	Intercept Trend & Intercept	0.684 -3.022*	-6.347*** -6.372***	-0.161 -2.912	-6.238*** -6.164***	I(1)
LNGEE	Intercept Trend & Intercept	0.224 -1.288	-3.833*** -4.562***	0.621 -1.164	-4.287*** -4.750***	I(1)
LNGEH	Intercept Trend & Intercept	-0.154 -1.759	-4.813*** -4.882***	0.050 -1.783	-4.672*** -4.624***	I(1)
LNTIW	Intercept Trend & Intercept	-0.461 -3.190*	-4.082*** -4.943***	-4.894*** -2.970	-6.591*** -9.817***	I(1)
LNTP	Intercept Trend & Intercept	0.547 -3.538**	-8.222*** -8.596***	1.232 -3.341*	-9.209*** -24.062***	I(1)
LNCE	Intercept Trend & Intercept	-0.232 -3.898*	-6.153*** -6.168***	-0.664 -3.649*	-9.473*** -8.091***	I(1)
LNCIT	Intercept Trend & Intercept	0.261 -5.489***	-0.449* -6.032***	-2.520 -9.309**	-11.189*** -10.343***	I(1)

Source: Author's compilation from Eviews output

Notes: (***), (**), (*) indicate 1 percent, 5 percent, and 10 percent level of significance, respectively. I(1) indicate stationarity after first differencing.

The stationarity test results based on the Dickey-Fuller Generalised Least Squares (DF-GLS) method indicates that one variable is stationary at level at 1 percent, one other variable is stationary at 5 percent while three variables are stationary at 10 percent. The DF-GLS test results further indicate that all the variables are stationary at 1 percent after first differencing with intercept and trend. The Phillips-Perron stationarity test results indicate that two variables are stationary at the level at 1 per cent while two others are stationary at levels at 10 per cent. The Phillips-Perron stationarity test results show that all the variables are stationary after first differencing and they are integrated of the first order I(1). Based on the two test results (the Dickey-Fuller Generalised Least Squares (DF-GLS) and the Phillips-Perron stationarity test results) collectively, we fail to reject the null hypothesis, and conclude that the data sets are non-stationary at a level. The DF-GLS and the Phillips-Perron stationarity test results jointly indicate that the variables are stationary after first differencing. In the next section, the cointegration test is conducted to determine if there is a long-run relationship between the dependent and independent variables.

3.2. ARDL Model Estimation and Cointegration Test Results

The next step is to estimate the standard ARDL model from which we can derive the long-run equation to establish the long-run relationship between the Gini coefficient and the selected explanatory variables. For this research, we employed the ARDL Bounds test approach to establish the long-run relationship between the variables. If the cointegration test results indicate that the variables are cointegrated, the ECM will be estimated to establish the short-term dynamics. The ARDL in-built/automatic lag selection criteria were employed to select the optimal number of lags for each variable. The optimal lags for the ARDL model are (1, 1, 1, 0, 0, 1, 1, 1). Table 3 below shows the results of the ARDL model.

Table 3. ARDL Model

Dependent Variable: LN_G					
Method: ARDL					
Date: 05/14/19 Time: 17:13					
Sample (adjusted): 1996Q2 2016Q4					
Included observations: 83 after adjustments					
Maximum dependent lags: 4 (Automatic selection)					
Model selection method: Akaike info criterion (AIC)					
Dynamic regressors (4 lags, automatic): LN_GESP LN_GEE LN_GEH LN_TIW LN_TP LN_CE LN_CIT					
Fixed regressors: C					
Number of models evaluated: 312500					
Selected Model: ARDL(1, 1, 1, 0, 0, 1, 1, 1)					
Variable		Coefficient	Std. Error	t-Statistic	Prob.*
C1	LN_G(-1)	0.889481	0.048878	18.19792	0.0000
C2	LN_GESP	-0.131894	0.021309	-6.189532	0.0000
C3	LN_GESP(-1)	0.105944	0.022771	4.652634	0.0000
C4	LN_GEE	-0.166086	0.039079	-4.250015	0.0001
C5	LN_GEE(-1)	0.145905	0.035550	4.104216	0.0001
C6	LN_GEH	0.014511	0.012155	1.193769	0.2367
C7	LN_TIW	-0.049179	0.023922	-2.055767	0.0436
C8	LN_TP	0.146049	0.027267	5.356175	0.0000
C9	LN_TP(-1)	-0.121935	0.026709	-4.565376	0.0000
C10	LN_CE	0.044029	0.016201	2.717755	0.0083
C11	LN_CE(-1)	-0.030385	0.016456	-1.846393	0.0691
C12	LN_CIT	0.115921	0.021942	5.282986	0.0000
C13	LN_CIT(-1)	-0.076091	0.016348	-4.654494	0.0000
C14	C	0.477109	0.231581	2.060221	0.0432
R-squared		0.983482	Mean dependent var		4.138346

Adjusted R-squared	0.980370	S.D. dependent var	0.080552
S.E. of regression	0.011286	Akaike info criterion	-5.977882
Sum squared resid	0.008789	Schwarz criterion	-5.569885
Log likelihood	262.0821	Hannan-Quinn criter.	-5.813972
F-statistic	316.0146	Durbin-Watson stat	2.076120
Prob(F-statistic)	0.000000		

Source: Author's compilation from Eviews output

The Wald test for coefficient significance is employed to test for the significance of the coefficients in the ARDL model above. The null and alternative hypotheses for the Wald test for coefficient significance are given below:

H_0: Coefficients = 0

H_1: Coefficients ≠ 0

We reject the null hypothesis if the p-value of the F-statistic is less than or equal to 0.05. The test is conducted in two categories, the first category consists of coefficients with a value less than 0.05 while the second category consists of coefficients with the p-value greater than 0.05 level of significance. The Wald test results are given in table 4 and 5 below:

Table 4. Wald Test Results for Significant Coefficients

Wald Test:			
Test Statistic	Value	df	Probability
F-statistic	101.3089	(11, 69)	0.0000
Chi-square	1114.398	11	0.0000
Null Hypothesis: C(1)=0, C(2)=0, C(3)=0, C(4)=0, C(5)=0, C(7)=0, C(8)=0, C(9)=0, C(10)=0, C(12)=0, C(13)=0			
Null Hypothesis Summary:			
Normalized Restriction (= 0)		Value	Std. Err.
C(1)		0.889481	0.048878
C(2)		-0.131894	0.021309
C(3)		0.105944	0.022771
C(4)		-0.166086	0.039079
C(5)		0.145905	0.035550
C(7)		-0.049179	0.023922
C(8)		0.146049	0.027267
C(9)		-0.121935	0.026709
C(10)		0.044029	0.016201
C(12)		0.115921	0.021942
C(13)		-0.076091	0.016348

Source: Author's compilation from Eviews output

Table 5. Wald Test Results for Redundant Variables

Wald Test:			
Test Statistic	Value	df	Probability
F-statistic	2.171887	(2, 69)	0.1217
Chi-square	4.343774	2	0.1140
Null Hypothesis: C(6)=0, C(11)=0			
Null Hypothesis Summary:			
Normalized Restriction (= 0)		Value	Std. Err.
C(6)		0.014511	0.012155
C(11)		-0.030385	0.016456

Source: Author's compilation from Eviews output

The Wald test results above confirm that C1, C2, C3, C4, C5, C7, C8, C9, C10, C12 and C13 are jointly statistically significant at 5 per cent level of significance while C6 and C11 are statistically insignificant or redundant variables. To confirm the strength of the ARDL model estimated, we can view the criteria graph which presents the best 20 models evaluated using the Akaike information criteria. The criteria graph is presented in figure 2 below:

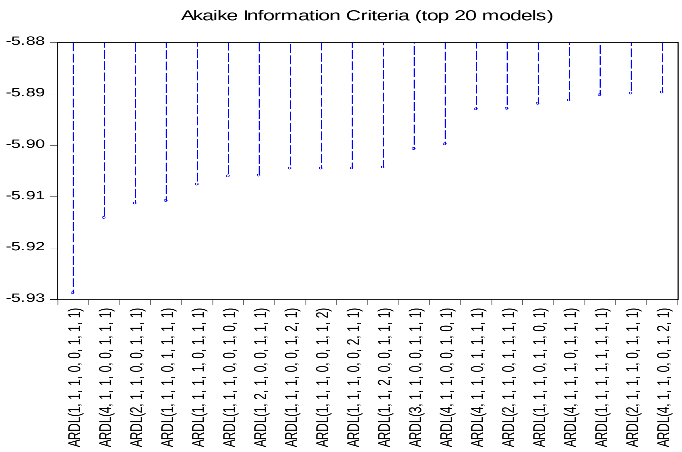

Figure 2. Akaike Information Criteria Graph

Source: Author's compilation from Eviews output

Based on the Akaike Information Criteria graph of the top 20 models above, we can observe that the selected model is superior compared to other models on the top 20 list. Using the results of the ARDL model in table 3 above, we can derive the long-run equation from the ARDL bounds testing through a simple linear transformation. The long-run equation is presented in table 6 below:

Table 6. Long Run Levels Equation

Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LN_GESP	-0.234804	0.119593	-1.963363	0.0536
LN_GEE	-0.182609	0.208150	-0.877295	0.3834
LN_GEH	0.131297	0.124376	1.055645	0.2948
LN_TIW	-0.444983	0.241550	-1.842200	0.0697
LN_TP	0.218184	0.195401	1.116600	0.2680
LN_CE	0.123456	0.105027	1.175465	0.2438
LN_CIT	0.360395	0.188926	1.907603	0.0606
C	4.316989	0.716023	6.029125	0.0000
Cointeq/ECT = LN_G - (-0.2348*LN_GESP -0.1826*LN_GEE + 0.1313*LN_GEH -0.4450*LN_TIW + 0.2182*LN_TP + 0.1235*LN_CE + [illegible]				
CointEq(-1)	-0.101450	0.032098	-3.160652	0.0023

Source: Author's compilation from Eviews output

The P-values associated with the long-run coefficients are all insignificant at a 5 per cent level of significance, therefore, we can conclude that there is no cointegration. To confirm the p-values of the long-run results above, we can conduct the ARDL bounds test. The bounds test results are presented in Table 7 below:

Table 7. F-Bounds Test Results

ARDL Bounds Test		
Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	k
F-statistic	1.046439	7
Critical Value Bounds		
Significance	I(0) Bound	I(1) Bound
10%	1.92	2.89
5%	2.17	3.21
2.5%	2.43	3.51
1%	2.73	3.9

Source: Author's compilation from Eviews output

The cointegration test results above confirm that all the variables do not have long-run relationships at 5 per cent level of significance, therefore, we cannot specify an error correction model.

3.2. ARDL Short-Run Model and Causality Test

The next step is to estimate the parsimonious ARDL model with differenced variables and conduct the short-run granger causality based on the t-statistics and the Wald F-test. Five control variables, namely, GDP growth, population growth, inflation, corruption perception index, and the unemployment rate were included in the model, however, desired results could not be obtained. The automatic/build-in lag selection criteria were employed to select the optimal number of lags for each variable in the model. The results of the ARDL model with differenced variables are presented in Table 8 below:

Table 8. ARDL Model with Differenced Variables

Dependent Variable: D(LN_G)				
Method: ARDL				
Maximum dependent lags: 4 (Automatic selection)				
Model selection method: Akaike info criterion (AIC)				
Dynamic regressors (4 lags, automatic): D(LN_GESP) D(LN_GEE) D(LN_GEH) D(LN_TIW) D(LN_TP) D(LN_CE) D(LN_CIT)				
Fixed regressors: C				
Number of models evaluated: 312500				
Selected Model: ARDL(4, 0, 0, 0, 0, 0, 0, 0)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
D(LN_G(-1))	-0.005016	0.063385	-0.079139	0.9372
D(LN_G(-2))	-0.005016	0.063385	-0.079139	0.9372
D(LN_G(-3))	-0.005016	0.063385	-0.079139	0.9372
D(LN_G(-4))	0.427349***	0.089109	4.795818	0.0000
D(LN_GESP)	-0.139709***	0.018818	-7.424107	0.0000
D(LN_GEE)	-0.146113***	0.044489	-3.284236	0.0016
D(LN_GEH)	-0.022352	0.024483	-0.912957	0.3645
D(LN_TIW)	-0.061108	0.046679	-1.309111	0.1950
D(LN_TP)	0.232441***	0.031974	7.269658	0.0000
D(LN_CE)	0.044395***	0.015637	2.839141	0.0060
D(LN_CIT)	0.119209***	0.028737	4.148300	0.0001
C	-0.000601	0.001373	-0.437300	0.6633
R-squared	0.733304	Mean dependent var		-0.002843
Adjusted R-squared	0.689518	S.D. dependent var		0.018345
S.E. of regression	0.010222	Akaike info criterion		-6.189477
Sum squared resid	0.007001	Schwarz criterion		-5.829560
Log likelihood	256.4843	Hannan-Quinn criteria.		-6.045283
F-statistic	16.74746	Durbin-Watson stat		1.997336
Prob(F-statistic)	0.000000			

Source: Author's compilation from Eviews output

Notes: (***), (**), (*) indicate 1 per cent, 5 per cent, and 10 per cent level of significance, respectively.

The short-run estimates in the table above reveal that Government expenditure on social pensions (GESP), government expenditure on education (GEE), tax on products (TP), corporate income tax (CIT) and customs and excise duties from SACU are statistically significant at 1 per cent level of significance in the short-run. Government expenditure on health (GEH) and tax on income and wealth were found to be statistically insignificant. The research findings reveal that government expenditure on social pensions has a reducing effect on the Gini coefficient, and it is statistically significant at 1 per cent with the P-Value of 0.0000. The coefficient of government expenditure on social pensions is -0.1397, which implies that a 1 percent increase in government expenditure on social pensions will lead to an improvement in the income distribution of 0.13 percent, ceteris paribus. This is in line with economic theory which stipulates that social transfers promote a fair distribution of income since it targets vulnerable members of society and boosts the purchasing power of people in the low-income category such as elderly people, physically and mentally challenged individuals, as well as orphans in the case of Namibia. Samuelson (1955) indicates that all redistributions take place through transfer expenditure. Several research findings have also indicated that social transfers have a positive impact on income distribution, e.g. the findings of empirical research conducted by Vaalavuo (2013) indicate that government expenditure on social welfare such as cash benefit/social pensions has a balancing effect on income distribution. Keynes (1936) also insists on the need for the government to intervene to correct market failures such as income inequality, through various interventions which include the provision of social pensions.

The coefficient of government expenditure on education is negative and significant. The P-value of government expenditure on education is 0.0016 and its coefficient is -0.14611, which implies that a 1 percent increase in government expenditure on education will lead to a reduction in the Gini coefficient by 0.15 percent, ceteris paribus. These results conform to economic theory, which suggests that government expenditure on education has a positive impact on income distribution as measured by the Gini coefficient. Samuelson (1955) highlighted the benefits and distributional effects of government expenditure on education. These results confirm the findings of the research conducted by Sylwester (2002) and Tsanos and Manos (1999), whose empirical research findings indicate that government expenditure on education has a balancing effect on income inequality. Another research by Martinez-Vasquez., *et al.* (2012) indicates that government expenditure on social welfare activities such as education services reduces income inequality.

Tax on products has a worsening effect on the Gini coefficient. The worsening effect is indicated by the coefficient of tax on products, which is positive and significant at 1 percent level of significance. Its P-value is 0.0000 while its coefficient is 0.2324 which implies that an increase in tax on products by 1 percent will lead to an increase in Gini coefficient by 0.23 percent, ceteris paribus/holding all other variables constant. The findings of empirical research by Leu, *et al.*, (2009) indicate that taxes have an unbalancing/regressive effect on income distribution. These findings are in line with economic theories and with empirical research findings of various researchers such as Mylonidis and Losifidi (2017), whose findings indicate that consumption taxes such as VAT or tax on products have a negative impact on income distribution. The negative impact of consumption taxes can be attributed to a number of factors, of which the key factors are summarised below:

Firstly, taxes on products have a negative impact on income distribution because they charge low-income earners a large fraction of their income and high-income earners a small fraction of their income. This is because consumption taxes such as a tax on products are regressive; as a result, they negatively affect low-income earners severely as opposed to high income earners. Secondly, when there is an increase in consumption taxes, retailers and businesses would pass on the tax burden to consumers by increasing the prices of goods and services on which the tax is levied. Because consumption taxes are regressive, people in the low-income category will be worse off as opposed to those in the high-income category. These results are confirmed by the research conducted by Martinez-Vazquez, *et al.*, (2012), whose findings indicate that consumption taxes have an unbalancing effect on income inequality.

The research findings indicate that customs and excise duty have a worsening effect on the Gini coefficient, which is a similar trend in consumption taxes discussed earlier in this subsection. The coefficient of customs and excise duty is positive and statistically significant at 1 percent significance level. The P-value of customs and excise duty is 0.0060 while its coefficient is 0.04439, which implies that an increase in customs and excise duty by 1 percent will lead to an increase in income inequality (Gini coefficient) by 0.04 percent, ceteris paribus. These results conform to economic theories and empirical findings, which suggest that consumption taxes are not effective in reducing income inequality. The findings of the research conducted by Mylonidis and Losifidi (2017) reveal that indirect taxes are not effective in reducing income inequality. Martinez-Vazquez, *et al.*, (2012) also arrived at the same conclusion that consumption taxes such as excise taxes and customs duties have an unbalancing effect on income inequality.

The empirical findings of this research indicate that corporate income tax/tax on corporations is statistically significant at 1 percent and has a negative impact on income distribution with the P-value of 0.0001. These findings are in line with the findings of Leu, *et al.,* (2009), whose research findings indicate that indirect taxes are regressive, contributing to an increase in inequality and poverty. The coefficient of corporate income tax is 0.1192, which implies that a 1 percent increase in corporate income tax will lead to a 0.12 percent increase in the Gini coefficient. This is in line with general economic theories and with the empirical research findings of various researchers such as Mylonidis and Losifidi (2017), whose research findings indicate that indirect taxes are not effective in reducing income inequality. Increasing corporate income tax has a worsening effect on income distribution because corporations and businesses pass on the increment in corporate tax to employees and consumers through low salaries, poor service benefits, and high prices of goods and services. This has a severe effect on employees in low-income group and ordinary citizens in the low-income category, thereby aggravating income inequality and poverty.

The R-squared value is 0.733304, which implies that 73.33 percent of the variation in the Gini coefficient is explained by the explanatory variables under investigation, namely, government expenditure on education, government expenditure on health, customs and excise duty from the SACU, tax on products, tax on income and wealth, government expenditure on social pensions, and corporate income tax. The remaining 26.67 percent is explained by the error term. The Durbin-Watson statistic is 1.9973, which is very close to 2, and this is an indication that there is no autocorrelation. The F-statistic is significant at 5 per cent, which shows that the estimated short-run ARDL model is robust.

3.3. Granger Causality and Diagnostic Test Results

The study employed the Granger causality tests to assess the short-term causality between the Gini coefficient and the selected explanatory variables. The granger causality test rests are given in table 9 below:

Table 9. Granger Causality Test Results

Dependent variable	**SHORT RUN GRANGER CAUSALITY**		**Tests Conclusion**
	t-Statistics	**Wald F-Test**	
D(LN_G)	D(LN_GESP) Significant	C(5)=0 55.11736(0.0000)	D(LN_GESP) Causes D(LN_G)
	D(LN_GEE) Significant	C(6)=0 10.78621(0.0016)	D(LN_GEE) Causes D(LN_G)
	D(LN_GEH) Insignificant	C(7)=0 0.833491(0.3645)	D(LN_GEH) does not cause D(LN_G
	D(LN_TIW) Insignificant	C(8)=0 1.713772 (0.1950)	D(LN_TIW) does not cause D(LN_G)
	D(LN_TP) Significant	C(9)=0 52.84793(0.0000)	D(LN_TP) Causes D(LN_G)
	D(LN_CE) Significant	C(10)=0 8.060723(0.0060)	D(LN_CE) Causes D(LN_G)
	D(LN_CIT) Significant	C(11)=0 17.20839(0.0001)	D(LN_CIT) Causes D(LN_G)

Source: Author's Compilation from Eviews Output

The short run Granger causality tests indicate that there is a statistically significant causal relationship between the Gini coefficient and five of the seven explanatory variables, namely, government expenditure on social pensions, government expenditure on education, tax on products, customs and excise duties from SACU and tax on income and wealth. The short run Granger causality test results further indicate that government expenditure on health and tax on income and wealth does not have a significant causal relationship with the Gini coefficient. The Granger causality results using the two tests above are supporting each other which implies that the results obtained are valid and robust.

Four diagnostic tests were conducted to assess the robustness of the estimated model. The robustness tests that were conducted are the Breusch-Godfrey serial correlation LM test, the ARCH test for heteroscedasticity, the Ramsey Regression Equation Specification Error Test (RESET) and the test Jarque-Bera normality test. Three of the four diagnostic tests reveal that the estimated model is robust. Table 10 below demonstrates the outcome of the diagnostic tests:

Table 10. Diagnostic Test Results

Breusch-Godfrey serial correlation LM test	
F-statistic: 0.000130	Prob. F: 0.9999
Obs*R-squared: 0.000315	Prob. Chi-Square: 0.9998
ARCH test results for heteroscedasticity	
F-statistic: 0.893661	Prob. F: 0.3475
Obs*R-squared: 0.906519	Prob. Chi-Square: 0.3410
Ramsey RESET test	
t-statistics	Prob. 0.5436
F-statistic	Prob. 0.5567
Jarque-Bera Normality Test results	
Jarque-Bera: 729.3972	Prob. 0.0000

Source: Author's Compilation from Eviews Output

The Breusch-Godfrey serial correlation LM test result indicates that there is no serial correlation and the ARCH test results for heteroscedasticity indicate that the residuals are homoscedastic. The Ramsey RESET test reveals that the model is correctly specified. The residuals are not normally distributed and this can be attributed to data extrapolation. Based on the test results of the majority of the tests, we can confidently conclude that the model is robust and statistically acceptable.

4. Conclusion

The research reveals that government expenditure on social pensions has a reducing effect on the Gini coefficient and that it is statistically significant at 1 percent, which suggests that an increase in government expenditure on social pensions will lead to a reduction in the Gini coefficient, representing an improvement in income distribution. Given this relationship, the government should maintain/improve the current social pension scheme because of its contribution towards a fair distribution of income. Government expenditure on education has an improvement or balancing effect on the Gini coefficient and it is statistically significant. This implies that an increase in government expenditure on education will lead to a reduction in income inequality as measured by the Gini coefficient. On that basis, the Namibian government should increase its expenditure on education; however, expenditure in the form of loans should be prioritised as opposed to grants and scholarships. Prioritising loans over grants and scholarships will ensure sustainability of the NSFAF in the long run because the funds will be revolving. The tax on products, customs and excise duty from the SACU, and corporate income tax have an unbalancing effect on the Gini coefficient and that they are significant determinants of the Gini coefficient. An increase in any of the three taxes mentioned above will lead to an increase in income inequality as measured by the Gini coefficient. The research recommends a tax mix and tax discrimination where certain products are highly taxed, e.g. luxury products. With the tax mix, some taxes can be slightly reduced, e.g. corporate tax to attract investors, while other taxes should be increased, e.g. sin tax (tax on alcohol and tobacco) to increase government revenue and discourage destructive habits. A tax mix and a hybrid of taxation and government expenditure components are strongly recommended to achieve a balance. Corporate companies should also be charged differently depending on the industries they operate and the nature of their operations. This should however be done with caution to ensure that the country remains competitive to foreign and local investors.

4.1. Limitations of the research

Considerable care was taken to ensure that this research is as acceptable and defensible as possible. However, a few challenges and limitations were experienced. The first limitation is the unavailability of national data for the years before independence. Data from 1990 and older is very limited or unavailable because there was no proper record due to the war in the country during that time. We should also take note that most of the institutions, e.g. Bank of Namibia and Namibia Statistics Agency, were established only after independence in 1990, which means that the records were unreliable or non-existent. As a result, the researchers used data from 1996 – 2016. Due to limited data, data extrapolation was conducted by converting annual observations to quarterly observations in Eviews to be able to conduct a complete assessment. The second limitation is that some explanatory variables were excluded because the data records available are very limited. Future studies can include some of the excluded variables such as transfer and stamp duties. Further analysis might include a Generalised Method of Moments (GMM) approach that could also be used with a panel of data in terms of SACU or SADC for future studies.

Despite these limitations and challenges that might affect the empirical findings of this research, it is assumed that these effects did not significantly affect the findings of the research. This assumption is backed by the fact that the results conform to theoretical and empirical literature and most diagnostic tests reveal that the estimated model is robust. On that basis, there is a very strong conviction that the results are credible and acceptable.

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